

Weeks Bay Watershed Project

Management Plan

April 2002

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Executive Summary

The Weeks Bay Watershed Management Plan is based on eight years of technical investigation and research by the Weeks Bay Watershed Project. This Project was initiated in 1993 to assess water quality conditions in the Weeks Bay Watershed and develop a plan for improving and protecting Weeks Bay. The goal of the Weeks Bay Watershed Project is to improve and maintain water quality in order to meet or exceed state water quality standards for Swimming and Fish and Wildlife water use classification.

The strategy for improving the watershed is based on the following fourteen objectives:

1. Reduce nonpoint source pollution from agricultural activities.
2. Reduce nonpoint source pollution from construction and land clearing activities.
3. Reduce nonpoint source pollution from residential sources.
4. Protect ground water resources through a reduction in nonpoint source pollution.
5. Reduce the pollution generated by water-related recreational activities, including sewage, petroleum products, and litter.
6. Continue Weeks Bay Water Watch monitoring and formally analyze data to identify trends and design recovery plans if necessary.
7. Ensure protection of fish and wildlife habitats, including submerged grassbeds, fringe marsh, shorelines, and other wetlands and upland forest through land acquisition, educational, and incentive programs.
8. Reduce pollution from existing and future on-site sewage systems.
9. Promote planning and zoning that will protect environmentally sensitive areas.
10. Identify unpaved roads that contribute sediment to the watershed and work with the County to develop a plan to improve these roads within a reasonable time frame.
11. Reduce water pollution from urban stormwater discharge sources including residential subdivisions and commercial areas.
12. Establish and maintain a system of priorities for academic research in addition to volunteer monitoring that will:

- a) contribute to the understanding of watershed conditions and processes, such as land use changes, habitat loss, and peak and minimal flows
 - b) assist in the establishment of trends in physical, chemical, and biological water quality parameters for surface and ground water; and
 - c) assist in decision-making activities of regulatory and management personnel by the transfer of technical and scientific information.
13. Provide for long-term support and involvement of watershed residents through the leadership of the Citizen Advisory Committee (CAC) and Watershed Project Coordinator on watershed planning and management activities.
14. Cooperate and partner with other Federal, State, and local agencies to achieve the objectives and strategies described herein.

The recommendations in this report are based on water quality data, land use/land cover information, and best professional judgment of staff from the Alabama Department of Conservation and Natural Resources, State Lands Division (ADCNR), Baldwin County Soil and Water Conservation District (SWCD), Geological Survey of Alabama (GSA), the Natural Resources Conservation Service (NRCS), Alabama Department of Environmental Management (ADEM), U.S. Fish and Wildlife Service (FWS), Alabama Department of Public Health (ADPH), Alabama Cooperative Extension System (ACES), Dauphin Island Sea Lab (DISL), and Weeks Bay National Estuarine Research Reserve (WBNERR). The strategies and task assignments are dependent on available resources, local support, and funding. The overall purpose of this document is to provide a plan for coordinating and utilizing Federal, State and local resources to improve and maintain water quality in Weeks Bay.



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List of Abbreviations

ACES	Alabama Cooperative Extension System
ACF	Alabama Coastal Foundation
ADAI	Alabama Department of Agriculture and Industries
ADCNR	Alabama Department of Conservation and Natural Resources
ADECA	Alabama Department of Economic and Community Affairs
ADEM	Alabama Department of Environmental Management
ADID	Baldwin County Wetland Advanced Identification
ADPH	Alabama Department of Public Health
AWW	Alabama Water Watch
BBC	Baldwin County Commission
BCEAB	Baldwin County Environmental Advisory Board
BMP	Best Management Practice
CAC	Weeks Bay Watershed Project Citizen Advisory Committee
CIAP	Alabama Coastal Impact Assistance Program
COE	US Army Corps of Engineers
CRC	Coastal Rivers Coalition
CRP	Conservation Reserve Program
CZMA	Coastal Zone Management Act
CZARA	Coastal Zone Management Act Reauthorization Amendments
DISL	Dauphin Island Sea Lab
DMR	Discharge Monitoring Reports
DO	Dissolved Oxygen
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FIP	Forestry Incentives Program
FDA	U.S. Food and Drug Administration
FPP	Farmland Protection Program
F&W	fish and wildlife
FWS	U.S. Fish and Wildlife Service
GBTY	<i>“Baldwin County Greener by the Yard”</i>
GCRCD	Gulf Coast Resource, Conservation and Development
GSA	Geological Survey of Alabama
HBAA	Homebuilders Association of Alabama
ONRW	“Outstanding National Resource Water”
NEMO	Nonpoint Source Pollution for Municipal Officials
NEP	Mobile Bay National Estuary Program
NERR	National Estuarine Research Reserve
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source (Pollution)
NRCS	Natural Resources Conservation Service

List of Abbreviations (continued)

OEO	Office of Education and Outreach
OSDS	Onsite Sewage Disposal System
PCB	polychlorinated biphenyls
POTW	Public/Private Owned Treatment Works
SARPC	South Alabama Regional Planning Commission
SAV	Submerged Aquatic Vegetation
SWCD	Baldwin County Soil and Water Conservation District
TAC	Weeks Bay Watershed Project Technical Advisory Committee
TMDL	Total Maximum Daily Loads
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WBRF	Weeks Bay Reserve Foundation
WBNERR	Weeks Bay National Estuarine Research Reserve
WBPPP	Weeks Bay Pollution Prevention Project
WHIP	Wildlife Habitat Incentives Program
WRP	Wetlands Reserve Program

I. INTRODUCTION

The Weeks Bay Watershed Management Plan is based on the results of eight years of technical investigation and research in the Weeks Bay Watershed by the Weeks Bay Watershed Project. The Project began when the Fish River Watershed Project was initiated in 1993 by the NRCS, U.S. Environmental Protection Agency (EPA) Gulf of Mexico Program and ADEM in cooperation with numerous other Federal and State agencies in order to provide an integrated holistic approach to the management of the Fish River Watershed. The Fish River Project was expanded in FY-94 to include the Magnolia River Watershed and the project was renamed "Weeks Bay Watershed Project". The Weeks Bay Watershed Project was initiated to assess water quality conditions in the Weeks Bay Watershed and develop a plan for improving and protecting Weeks Bay. Interagency coordination has assured that the project is technically consistent with the Coastal Zone Management Act Reauthorization Amendments (CZMARA) of 1990 and other Federal, State, and local regulations.

The Weeks Bay Watershed Project is a multi-agency project governed by the CAC that is supported by a Technical Advisory Committee (TAC) and an Education Subcommittee (Appendix 1). Approximately 20 Federal and State agencies and local organizations are actively involved in the project.

A. Purpose of Plan

The goal of the Weeks Bay Watershed Project is to improve and protect water quality in the Watershed in order to meet or exceed Alabama water quality standards for Swimming and Fish and Wildlife classification. This management plan describes the fourteen objectives that will lead to the accomplishment of this goal. Specific strategies that focus on cooperative action are presented for each objective. Plan objectives and strategies have been developed with assistance from technical experts and the CAC. The CAC has held a series of community forums to present the issues to be addressed in the plan and solicit additional public input.

B. Weeks Bay Watershed Project Research and Monitoring

The Weeks Bay Watershed has been the focus of numerous research and monitoring projects over the last 10 years. Many of the projects have been supported by ADEM and EPA, Region IV's Clean Water Act, Section 319 Program. A summary of research in the Weeks Bay Watershed that has been supported by the EPA Section 319 Program is provided below.

1. Alabama Department of Public Health (ADPH)
Construction and monitoring of four alternative on-site wastewater treatment systems. Four constructed wetland systems were installed at four residences on Fish River in October 1995. Systems were monitored following construction to determine effluent water quality.
2. Geological Survey of Alabama (GSA)

Monitoring of surface water to determine effects of using agricultural best management practices (BMPs) in the Weeks Bay Watershed. GSA began monitoring water quality at 16 sites for a number of chemical, physical and biological parameters in January 1994.

3. U.S. Geological Survey (USGS)
Maintain and operate water level gaging stations at two sites within the Weeks Bay Watershed. One instream gaging station is located on Fish River in Silverhill, located at the Highway 104 bridge. The other instream gaging station is located in Magnolia River at the Highway 98 bridge.
4. Alabama Water Watch (AWW)
AWW is a statewide organization, based at Auburn University, Auburn, Alabama, which recruits, trains and equips citizens to monitor water quality. AWW assisted WBNERR in establishing a citizen volunteer monitoring program in April 1995. AWW partners in training and assists in the purchase monitoring equipment. Currently, twenty-eight sites in the Weeks Bay Watershed are monitored by citizen volunteers that have been certified according to the AWW QA/QC plan.

C. Overview of Report

This management plan was designed for simple use and review. Section II of the management plan provides a description of the Watershed that includes its location, environmental significance, climate, soils, land use, and population growth. Section III focuses on the issues that have been identified. Issues include documented problems as well as concerns of the local citizens. Section IV describes some of the regulatory and non-regulatory water quality management tools that are available. Section V is the Strategy for Protection, i.e., the specific actions that will need to be undertaken to achieve the goals of the Watershed Project.

The Weeks Bay Watershed Management Plan is revised at least every five years. Future revisions will be based in part on research and information needs included in, but not limited to, the "Weeks Bay National Estuarine Research Reserve: An Estuarine Profile and Bibliography." Semi-annual Weeks Bay Watershed Reports will be published including any site characterization changes.

II. DESCRIPTION OF THE WATERSHED

From the headwaters of Fish and Magnolia rivers to the brackish waters of Weeks Bay, the Weeks Bay Watershed encompasses a rich mosaic of upland and coastal habitats that support thousands of plant and animal species. The beauty of this area continues to attract large numbers of new residents who seek to make their homes along the shores as well as in woodlands and on farms in the Watershed. Estuaries like Weeks Bay, where salt water and freshwater mix, are among the world's most important and productive ecosystems. Understanding, restoring, and preserving the Watershed's important habitats are critical to protecting the long-term integrity of Weeks Bay.

A. LOCATION

The Weeks Bay Watershed Project area includes about 149,700 acres located in southwest Alabama's Baldwin County (Figure 1). Weeks Bay is a shallow 3,000-acre sub-estuary of Mobile Bay. Two major rivers flow into Weeks Bay (Figure 2). Fish River enters the Bay from the north, and Magnolia River enters from the southeast. The Fish River Watershed begins near the town of Stapleton, Alabama, and flows in a southerly direction. The eastern boundary of the Fish River Watershed is near U.S. Highway 59. The western boundary is between U.S. Highway 31, County Roads (CR) 27 and 98. Parts of the cities of Spanish Fort, Daphne, Loxley, Robertsedale, Silverhill and Fairhope are located within the Fish River Watershed area. The Magnolia River Watershed begins near Summerdale, Alabama and flows in a southwesterly direction toward Weeks Bay. Portions of the towns of Summerdale and Foley are included in the Magnolia River Watershed.

B. ENVIRONMENTAL IMPORTANCE

Weeks Bay is an estuary of national significance. In February 1986, Weeks Bay was officially designated as the nation's 16th National Estuarine Research Reserve (NERR). The NERR system (originally named the National Estuarine Sanctuary Program) was developed as a component of the Coastal Zone Management Act (CZMA) of 1972. Congress designated the National Oceanic and Atmospheric Administration (NOAA) responsible for administering the program and working with states in establishing Estuarine Research Reserves. The NERR system was included in the 1986 Reauthorization of the CZMA.

The goal of the NERRS program is to establish and manage, through Federal-State cooperation, a national system of reserves representing different coastal (biogeographic) regions and estuarine types that exist in the United States and its territories. There are presently 27 reserves in the system. The reserves are used primarily for long-term scientific research, public education, and resource protection. Reserves provide relatively undisturbed areas for research and education and provide a pristine standard

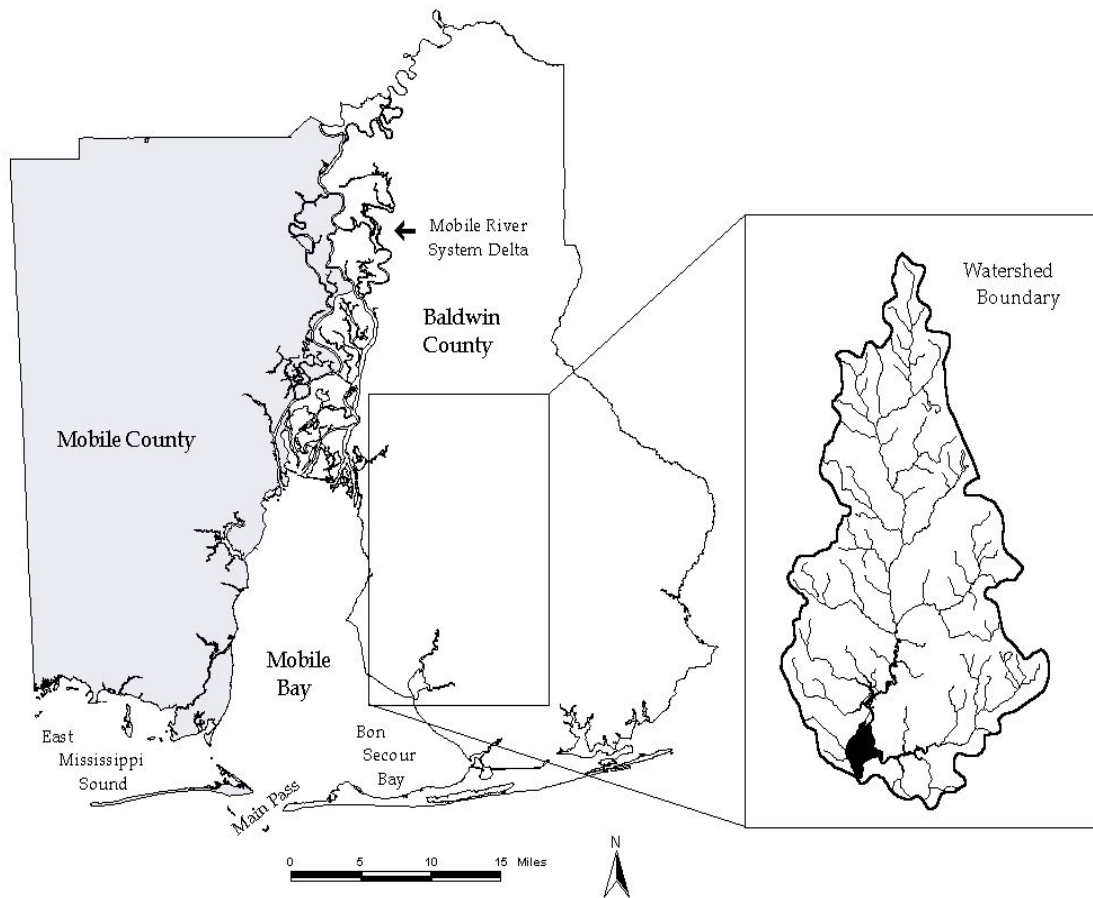


Figure 1. Location of Weeks Bay Watershed in Baldwin County, Alabama.

against which the effects of human activities on other areas can be assessed. The information and data accumulated during this study are essential to coastal zone management decision-making. The WBNERR represents the Mississippi Delta subcategory of the Louisiana biogeographic province and is a system characteristic of the central Gulf of Mexico coast. It is one of only four reserves in the Gulf of Mexico region.

The NERRS program authorizes funds in the form of 70/30 percent matching grants to states for acquiring significant estuarine areas, developing and operating research facilities and conducting educational programs. The agency in Alabama responsible for overseeing and administering this program is the Alabama Department of Conservation and Natural Resources (ADCNR), State Lands Division, Coastal Section.

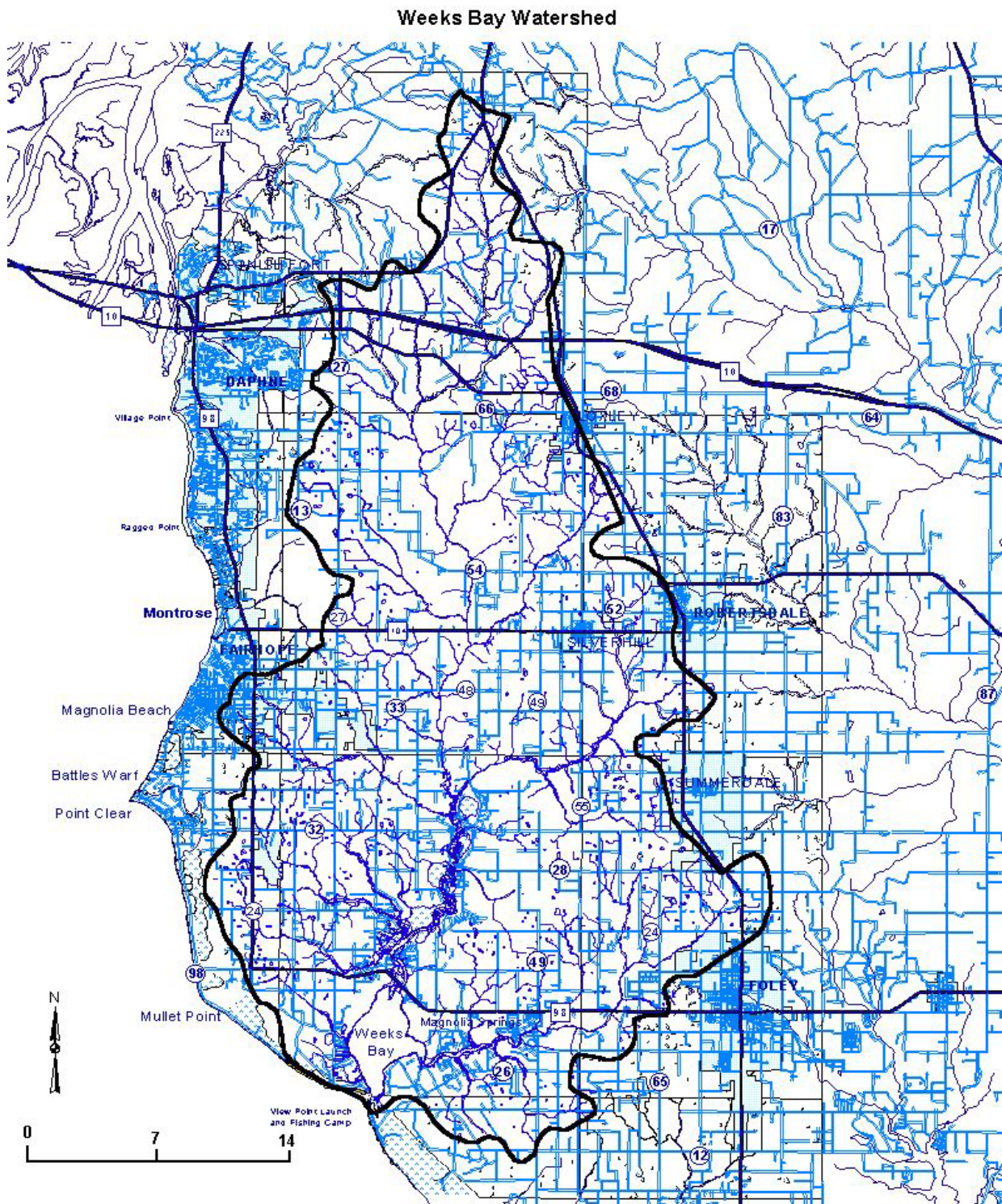


Figure 2. Weeks Bay Watershed Map

In 1991, the WBNERR Advisory Committee proposed the designation of Weeks Bay as an “Outstanding National Resource Water” (ONRW). The ONRW status provides for special protection of waters for which ordinary use classifications and water quality criteria do not suffice. ONRW regulations limit the type and number of potential polluting discharges into Weeks Bay. After a period of public comment and agency review, the EPA conferred ONRW status in August 1992.

C. CLIMATE (Paraphrased from Schroeder 1996)

The Weeks Bay Watershed lies in the humid subtropical climate region (Trewartha and Horn 1980), a climate that dominates the Gulf Coast States and Florida peninsula. Summers are characteristically warm while winters are relatively mild with occasional cold waves. In the contiguous United States, this region is second only to the Pacific Northwest in total annual rainfall (Baldwin 1973), receiving precipitation from a combination of winter storms, thunderstorms and tropical systems.

Summer Climate

High barometric pressure over the Atlantic Ocean is a dominant factor in the summer weather pattern. This semi-permanent weather system, called the subtropical anticyclone, provides a persistent southerly flow of humid air from the Gulf of Mexico. This air is normally unstable and thus, is easily lifted and condensed through convective heating or sea breeze convergences. As a result, thunderstorms are frequent and account for the major portion of summer rainfall. The frequency of thunderstorms over coastal Alabama is surpassed in the United States only by the Florida peninsula.

The influx of moisture from the Gulf of Mexico, in combination with numerous thunderstorms, produces a small diurnal temperature range during the summer. Average maximum air temperatures during the summer months vary from the upper 20°C (80°F) to the low 30°C (90°F) range in the vicinity of the Weeks Bay Watershed. Although temperatures may rise rapidly during the morning hours, the high frequency of thunderstorms usually limits the daily temperature peak at around 32 to 33°C (90 to 92°F) (Williams 1973). Because of the high absolute humidity during this period, temperatures of 38°C (100°F) or higher are occasionally observed in the Bay area.

Winter Climate

During the winter months, the Atlantic subtropical anticyclone retreats southward allowing the polar front to make numerous incursions into the Gulf States region from September to May. The arrival of polar air is frequently marked by heavy rain and a strong wind shift from southerly to northwesterly. When extremely low temperatures occur for at least two successive nights, freezing of the Bay may take place near shore.

Winter Storms

Although summer thunderstorms are numerous and greatly contribute to high annual rainfall totals, winter storms also produce heavy downpours. Those winter storms with the greatest impact upon the estuarine system originate in west Texas or along the Texas coast and are usually formed by upper atmosphere troughs that track across the southwestern U.S. Surface cyclones developing beneath these troughs either move eastward from Texas across the Gulf States or along the coast. Storms of this type gain enormous energy from the contrast between warm Gulf waters and cold polar air positioned over the Gulf States. The high frequency of winter storms accounts for a secondary rainfall maximum in March for many Gulf coast regions. For areas around the Weeks Bay estuarine system, July slightly exceeds March as the wettest month with an average of more than 17.8 cm. (7 in.) of rain (Schroeder et al. 1990b).

Tropical Storms

The central Gulf coast had one of the highest frequencies of hurricane landfall in the United States for the period 1871 - 1990. The average occurrence of tropical storms from 1871 was 2.2 storms making landfall along every 18.5 km (10 nautical miles) stretch of the Gulf coast (Neumann et al. 1981). Tropical storms are capable of producing enormous rainfalls over the bay and surrounding areas. Rainfalls of 13 to 25 cm (5 to 10 in.) are not unusual. In July of 1997 rainfall estimates from Hurricane Danny were 27 in. in the area of the Weeks Bay Watershed. However, hurricane rainfall totals vary considerably from storm to storm. When totals are high, the combination of flood runoff, erosion and the destruction of trees and buildings on shoreline results in the transport of large amounts of sediment and debris into parts of Weeks Bay Watershed and into Weeks Bay itself. This can have a profound post-storm impact on the ecosystem.

D. PHYSICAL AND GEOLOGIC FEATURES (Paraphrased from Chermock 1974)

The Weeks Bay Watershed lies within parts of the Southern Pine Hills and Coastal Lowlands subdivisions of the East Gulf Coast section of the Coastal Plain province. The Southern Pine Hills subdivision is a moderately dissected, southward sloping plain developed on sediments of Miocene to Pleistocene age (Boone 1974). In coastal Alabama, the Southern Pine Hills range to 100 feet in elevation with numerous shallow saucer-like depressions. These depressions are scattered over nearly level interfluvies and hold water most of the year.

The Coastal Lowlands subdivision is an essentially flat to gently undulating plain extending along the coast adjacent to Mississippi Sound, along the margins of the bays and behind the coastal beaches. They merge inland with the alluvial-deltaic plains of the Mobile-Tensaw and Perdido fluvial systems and smaller streams of the area. The lowlands are inundated by many tidewater creeks and rivers and fringed by tidal marshes. Alluvial, deltaic,

estuarine, and coastal deposits of Pleistocene and Holocene age underlie the Coastal Lowlands.

The Southern Pine Hills and Coastal Lowlands are separated by erosional escarpments with relief up to 100 feet. At their seaward margin they are curvilinear to the coast. They curve and extend inland forming subparallel facing escarpments that parallel the streams of the area. Carlston (1950) has interpreted the southern parts of these erosional escarpments as marine wave-cut scarps of Pamlico (Pleistocene) age. It is believed that the Weeks Bay embayment was formed during the Pleistocene (Smith 1986).

E. SOILS

Soils are grouped according to common characteristics. Soils for the Watershed are grouped into three major soil groups: Zonal soils, Intrazonal soils, and Azonal soils.

Zonal Soils

The zonal soils consist of soils having well-developed profile characteristics that reflect the influence of the active factors of soil formation. The active factors are climate, vegetation, and animal life. The zonal soils have an illuviated A horizon that is underlain by a finer textured illuviated B horizon. The C horizon varies in texture, but is generally coarser textured than the B horizon. These soils are well drained and acid. Zonal soils are considered to be the more productive agriculture soils. This group makes up 57 percent (72,200 acres) of the total Watershed. The major soils are Norfolk, Marlboro, Kalmia, Tifton, Bowie, Cuthbert, Ruston, Goldsboro, Redbay, Orangeburg, Magnolia, Faceville, Lynchburg, Sunsweet, and Greenville.

Intrazonal Soils

The intrazonal soils have genetically related horizons, which reflect the dominant influence of a local factor of relief or parent material, over the effects of climate and plant and animal life. These soils are poorly drained to very poorly drained. They are normally associated with swamp-forest or marsh vegetation. These soils have a high organic content and are normally strongly acid. This group makes up 15 percent (18,900 acres) of the total Watershed. The major soils are Bibb, Grady, Myatt, Plummer, Rains, Bayboro, Hyde, Okenee, and Scranton. These soils are considered hydric soils and normally will be classified as wetlands if no land alterations have occurred.

Another group of intrazonal soils are the planosols. These soils need to be distinguished from the others due to their high clay content. These soils are normally not hydric, but have a fragipan that is very compact and usually restricts root growth. This group makes up 5 percent (6,000 acres) of the total Watershed. The major soils are Leaf, Wahee, and Robertsdale.

Azonal Soils

The azonal soils consist of soils that lack distinct genetically related horizons, generally because of youth, resistant parent material, or steep topography. These soils are normally well drained to excessively well drained and are sands and loamy sands. This group makes up 23 percent (28,800 acres) of the Watershed area. The major soils are Lakeland, Eustis, Klej, and Lakewood.

F. LAND USE AND POPULATION GROWTH

The Weeks Bay Watershed Project area encompasses about 149,732 acres in Baldwin County in southwest Alabama. Parts of the city limits of Fairhope, Robertsedale, Foley and Loxley are located in the project area. In 1997, town officials estimated populations to be 12,000, 3,200, 9,400, and 1,600, respectively. Census results for Baldwin County in 2000 put population numbers at 140,415, up 43% from the 1990 population of 98,280. The Watershed is primarily rural, but it is within commuting distance from Mobile, Alabama and Pensacola, Florida. Baldwin County is the second fastest growing county in Alabama behind only Shelby County.

General land use in the project area, as estimated by the Baldwin County Soil and Water Conservation District in 2000, is summarized in Table 1. The dominant land uses are agricultural. Row crops and livestock production are major farm enterprises. The principal row crops are cotton, corn, soybeans, and vegetables. There are an estimated 550 farms, including silviculture tracts, averaging 208 acres in size in the project area.

Table 1. Generalized Land Use in the Weeks Bay Watershed

Land Use	Acres	Percent
Cropland	51,000	34
Pasture and Hayland	11,400	7
Forestland	72,900	49
Urban and Other Uses	14,400	10
Totals	149,700	100

Development of shopping areas has followed population movement. These areas have been allocated with respect to existing centers, residential density and transportation facilities. A substantial increase in commercial areas within the Watershed has occurred recently, especially along the Eastern Shore, adjacent to Highway 98 and on the outskirts of the City of Foley.

A Generalized Land Use Plan of Baldwin County was developed in 1992 by the South Alabama Regional Planning Commission (SARPC 1993). The plan (Figure 3) was based upon recent population changes and development projections. The purpose of the land use plan is to designate adequate amounts of land for delineated land uses based on the projected growth of the county and to ensure that these comprise a harmonious arrangement of uses for the county and its residents.

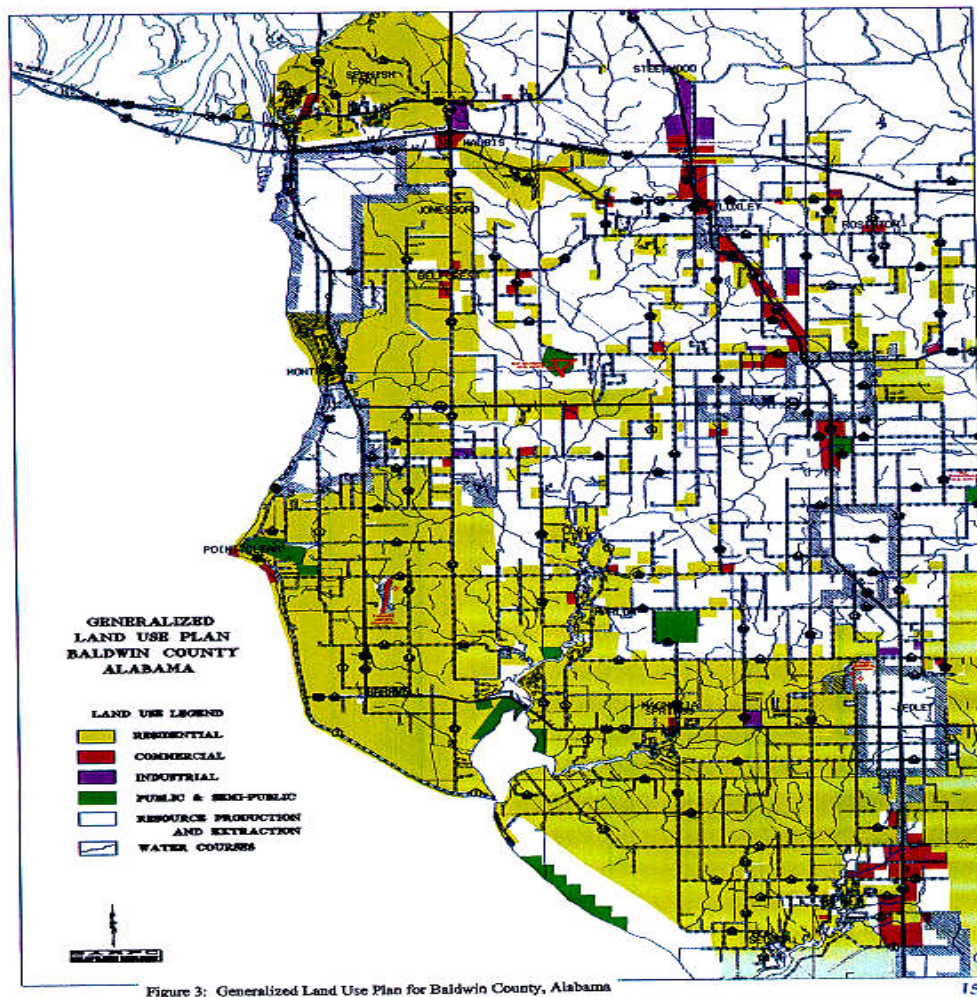


Figure 3. Generalized Land Use Plan for Baldwin County, Alabama

The Baldwin County Land Use Plan was designed as a general guide for long-range development in the county. Changes in 1990 and projected (2010) land use in Baldwin County are described in Table 2. The Baldwin County Land Use Plan indicates a likelihood of increased residential growth, especially along waterbodies, for the area of Baldwin County that includes the Weeks Bay Watershed. Recently, rapid commercial growth has occurred in the area, especially along transportation arteries. The implications of this growth, both short - and long-term, indicate that management of growth with regard to resource protection will be a challenge in the Weeks Bay Watershed.

Table 2. A Comparison of Existing and Estimated Future Land Use in Baldwin County

Classification	1990	Acres	2010	Acres	Change	Percent
Developed						
Residential	12,285		16,250	3,965		+32.28
Commercial	1,802		2,708	906		+50.28
Industrial	907		1,586	679		+74.86
Public/Semi-public	31,036		42,742	11,706		+37.72
Subtotal Developed	46,030		63,286	17,256		+37.49
Undeveloped						
Resource Production and extraction	721,463		718,546	-2,917		-0.40
Vacant	68,345		54,006	-14,339		-21
Wetlands	174,082		174,082	0		0
Water	46,462		46,462	0		0
Subtotal Undeveloped	1,010,352		993,096	17,256		-1.71
Total Area	1,056,382		1,056,382			
¹ County Land Use Plan, South Alabama Regional Planning Commission, 1993						

SARPC's 1993 Situation Analysis (SARPC 1993) offers the following conclusions and recommendations: "From a planning perspective, the most important aspects of assuring quality development resulting from population growth in any area are implementing growth management policies that provide a suitable arrangement of compatible land uses with adequate infrastructure (roads, drainage, water, sewer) that protects and blends with the natural environment. Thus, controlling the physical development of the county is of prime importance, and it is an issue that must be dealt with 'up front' as people come into the area. Properly constructed new subdivisions in compatible zone areas are a key to the future quality of physical development in the county. By requiring properly improved streets, drainage and utilities as developments occur, the county will eliminate many new problems that would have to be corrected at some future date, at higher than present prices, and most likely at taxpayers' expense."

Additional land use data was accumulated in 2000 using satellite remote sensing technology by a Mississippi State University graduate student as part of a WBNERR research fellowship (Cartwright, CAC Presentation, July, 2001). The data indicated that urban land use increased a startling 129% from 1990 to 2000. On the other hand, woodland land use decreased by nearly 23%. The data used to estimate these land use changes are unofficial and are being ground proofed at present, however the data illustrate the dramatic changes in land use that are occurring in the Watershed. Also, the research project demonstrates the utility of powerful remote sensing technology like satellite, radar and lidar imaging.

G. ECONOMIC DEVELOPMENT

Good environmental quality in the Weeks Bay Watershed contributes to the economic health of the region in many ways. Traditional land uses such as agriculture and silviculture continue to thrive in this portion of Baldwin County. Commercial fishing in Weeks Bay and Mobile Bay contributes significantly to the regional economy. Baldwin County leads all other counties in the State of Alabama in revenues from tourism, an industry fueled in large part by the abundance of beaches and water-related recreational opportunities. Much of this growth has been in the "Eastern Shore" area of Baldwin County. The towns of Daphne and Fairhope are spreading eastward into the Weeks Bay Watershed. New residents are attracted by the rural character of the area as well as its proximity to the rivers and bays. As in many other communities, the real estate market is closely tied to aesthetic and environmental conditions such as land use and water quality.

The economy of the Weeks Bay Watershed is heavily dependent upon agriculture. Row crops and livestock production are the major farm enterprises. In Baldwin County, harvested acres of corn, cotton, hay, wheat, and soybeans and pecans totaled 5,300; 15,800; 9,000; 9,900; 21,000 and 4,055 acres, respectively in 1999. In Weeks Bay Watershed, harvested acres

of corn, cotton, hay and wheat amount to approximately 40% of all Baldwin County's totals. Cash receipts for all commodity crops totaled \$87,315,000 in 1999. Cattle in Baldwin County were estimated to be 29,000 head (Alabama Agriculture Statistics 2000). Total cash receipts for farm and forestry products were estimated at \$108 million (Alabama Agricultural Statistics 2000).

Commercial fishing is an important industry in coastal Alabama. Several species of finfish are commercially harvested in Weeks Bay by gill netting. These include sheepshead (*Archosargus probatocephalus*), white trout (*Cynoscion arenarius*), mullet (*Mugil cephalus*, *M. curema*) and flounder (*Paralichthys lethostigma*, *P. albigutta*, *Etropus crossotus*). The most abundant commercial finfish species in Weeks Bay is Gulf menhaden (*Brevoortia patronus*). These species exist in Weeks Bay as juveniles, feeding and growing in the bay until emigrating and supporting a major commercial fishery in the Gulf of Mexico. Because shrimp present in Weeks Bay are nearly always smaller than the legal average count of 68 per pound, commercial shrimping in Weeks Bay was permanently closed by the Alabama Department of Conservation in 1980. Commercial crabbing for blue crab (*Callinectes sapidus*) in Weeks Bay is abundant. Weeks Bay is an important nursery area for blue crab, as suggested by their distribution within the bay. The upper bay area, near the mouth of Fish River, is dominated by very young juveniles while the bay mouth has the highest proportion of adult crabs (McClintock et al. 1993). Oyster beds in Bon Secour Bay were once abundant and commercially important. Ritter observed the oyster beds in 1896 (Ritter 1896). Today, there are live oyster beds present in Weeks Bay, however Weeks Bay is classified as conditionally closed to shellfish harvest by the Alabama State Health Department due to high fecal coliform counts.

Baldwin County's beaches, bays and rivers promote an ever-increasing tourism industry. According to the Alabama Bureau of Travel and Tourism, the best indicator for the economic significance of travel and tourism in an area is the number of people employed by the industry. Baldwin County leads all other counties in the State of Alabama in the number of people (over 17,000) employed by the tourism industry (Alabama Bureau of Travel and Tourism 1997, personal communication). Recreational activities enjoyed by tourists include visiting beaches, fishing, boating, waterskiing, golfing, shopping, hunting and bird-watching.

The majority of Baldwin County's tourism industry is most likely attributed to beaches and attractions in the Gulf Shores area, whereas the Weeks Bay Watershed is a popular fishing and boating destination for county residents. The Weeks Bay National Estuarine Research Reserve's Interpretive Center receives a large number of visitors each year. In 1999 over 18,000 visitors toured the Interpretive Center. Visitation is expected to increase as trails and public facilities are expanded at the Reserve. As such, the Weeks Bay Reserve facilities and natural resources are an asset to Baldwin County's tourism industry.

III. ENVIRONMENTAL PROBLEMS

Environmental problems in the Watershed have been well documented by the Watershed Project and the Alabama Natural Heritage Program. The majority of the water quality problems can be attributed to agriculture, construction, unpaved roads, inadequate or malfunctioning septic tank systems, and increased urban development.

Activities that result in a concentrated discharge into surface waters are referred to as “point source discharges” and include discharges from municipal wastewater treatment facilities and industrial sites. There are no point sources that discharge directly into Weeks Bay; however, several point sources discharge into the Fish River and Bay Branch, a tributary to Fish River. The Town of Loxley’s municipal wastewater treatment system (secondary treatment, 3-celled lagoon system, <2.5 million gallons per day) discharges into Fish River near the CR 64 Bridge. The Plantation Hills subdivision wastewater treatment system (secondary treatment, 1 tank package system <2.5 million gallons per day) discharges to Bay Branch just upstream from its confluence with Fish River.

Nonpoint source pollution is generally associated with stormwater runoff that carries sediment, inorganic nutrients, toxins and organic material into receiving waters. In addition, groundwater, which eventually enters Weeks Bay via spring discharge and seepage to streams, can become contaminated and thereby pollute surface waters. Nonagricultural nonpoint sources of pollution include rainfall runoff from parking lots, industrial sites, landfills, air pollutants, leaching of toxic chemicals from boat hulls, leaking septic tanks and overflows from municipal storm sewers. Agricultural runoff contributes sediment, nutrients, pesticides and bacteria to surface waters. Approximately 93% of the land in the Watershed is used for agriculture or silviculture (paraphrased from Valentine and Lynn 1996.)

The State of Alabama adopted water use classifications under Administrative Code of Alabama 1975 Title 22 Section 22-22-1. The water use classifications amended in April, 2000 (Administrative Code of Alabama 335-6-10) include: Public Water Supply, Swimming and Other Whole Body Water-Contact Sports, Shellfish Harvesting, Fish and Wildlife, Agricultural and Industrial Water Supply, Limited Warmwater Fishery and Outstanding Alabama Water (see Table 3). The waterbodies within the Weeks Bay Watershed are classified as Swimming and Other Whole Body Contact Sports and/or Fish and Wildlife (Figure 4).

Water quality criteria have been developed for each water use classification. “The water criteria provide the tools and means for determining the manner in which waters of the State may be best utilized, provide a guide for the determination of waste treatment requirements, and provide the basis for standards of quality for the State waters and portions thereof (ADEM Water Division, Water Quality Program, Chapter 33-6-10 Water Quality Criteria)”. Water quality criteria have been developed for the following: treatment of toxic substances, taste and odor producing substances, sewage, industrial wastes or other wastes, pH, water temperature, dissolved oxygen, bacteria, radioactivity, and turbidity. See Table 3 for water quality criteria associated with these and all other use classifications.

Table 3. Alabama Water use Classifications and Standards, Administrative Code of Alabama, Chapter 335-6-10.

Classification	pH	Temperature	Wastewater Effluent Limits	Dissolved Oxygen	Fecal Coliforms	Turbidity	Toxicity, Taste, Odor & Color
	(SU)	(°F)	(mg/L)	(mg/L)	(colonies/100ml)	(NTU)	
Outstanding National Resource Waters			No Discharge(Nonpoint Source Pollution Best Management Practices Mandatory)				
Outstanding Alabama Waters	6.0-8.5 ¹	90 (86 ²); Inland: 5 ³ Coastal: 4 & 1.5 ³	NH ₃ -N=3.0 BOD ₅ =15.0 D.O.=6.0	5.5	200 (inland) ⁴ 100 (coastal) ⁴	50 ⁷	Substances will not cause acute toxicity or chronic toxicity, impair the palatability or marketability of fish and wildlife or unreasonably affect the aesthetic value of waters for any use.
Swimming	6.0-8.5 ¹	90 (86 ²); Inland: 5 ³ Coastal: 4 & 1.5 ³		5.0	200 (inland) ⁴ 100 (coastal) ⁴	50 ⁷	Substances will not render unsafe or unsuitable for swimming/water-contact sports, cause acute toxicity or chronic toxicity, impair the palatability or marketability of fish and wildlife or unreasonably affect the aesthetic value of waters for any use.
Shellfish Harvesting	6.0-8.5 ¹	90 (86 ²); Inland: 5 ³ Coastal: 4 & 1.5 ³		5.0	See Shellfish Manual, FDA (1965)	50 ⁷	Substances will not cause acute toxicity or chronic toxicity, impair the palatability or marketability of fish and wildlife or unreasonably affect the aesthetic value of waters for any use.
Public Water Supply	6.0-8.5 ¹	90 (86 ²); Inland: 5 ³ Coastal: 4 & 1.5 ³		5.0	1000 ⁴ /2000 ⁵ 200 (inland) ^{4,6} 100 (coastal) ^{4,6}	50 ⁷	Substances will not cause acute toxicity or chronic toxicity, will not cause taste and odor difficulties in water supplies which cannot be corrected by treatment as specified, or impair the palatability of fish.
Fish and Wildlife	6.0-8.5 ¹	90 (86 ²); Inland: 5 ³ Coastal: 4 & 1.5 ³		5.0	1000 ⁴ /2000 ⁵ 200 (inland) ^{4,6} 100 (coastal) ^{4,6}	50 ⁷	Substances will not cause acute toxicity or chronic toxicity, impair the palatability or marketability of fish and wildlife or unreasonably affect the aesthetic value of waters for any use.
Agricultural and Industrial Water Supply	6.0-8.5 ¹	90 (86 ²); Inland: 5 ³ Coastal: 4 & 1.5 ³		5.0	2000 ⁴ /4000 ⁵	50 ⁷	Substances will not render the waters unsuitable for irrigation, livestock, industrial cooling, and process uses; interfere with downstream uses.
Limited Freshwater Fishery				3.0	1000 ⁴ /2000 ⁵	50 ⁷	Substances will not render the waters unsuitable for irrigation, livestock, industrial cooling, and process uses; interfere with downstream uses; or exhibit acute toxicity or chronic toxicity.

¹ +/- 1 pH SU from ambient and ranging 6.0-8.5 in all waters

⁴ Geometric mean of no less than 5 samples over a 30 day period no less than 24hr apart

² Limit in Tennessee and Cahaba River Basins; Tallapoosa River Basin: Thurlow Dam

⁵ Daily maximum

to junction of Coosa and Tallapoosa Rivers.

⁶ Incidental or recreational contact Jun-Sep

³ Maximum instream temperature rise above ambient due to discharge

⁷ Turbidity above natural condition of receiving water.

Coastal= 4°F (Oct-May); 1.5°F (Jun-Sep)

The GSA, as part of a cooperative project with ADEM initiated water quality sampling in the Weeks Bay Watershed on January 1, 1994. Water sampling continued until January 1999. The purpose of this sampling program was to acquire data for evaluating effects of installing BMPs in the Weeks Bay Watershed for controlling nonpoint source water pollution. Water-analysis data for 20 surface water sites reflect specific water-quality problems relative to standards that apply to fish and wildlife (F&W), a major water use classification for surface waters in the Weeks Bay Watershed. A report prepared by GSA containing the results of the study is available for review at the Weeks Bay Watershed Project office.

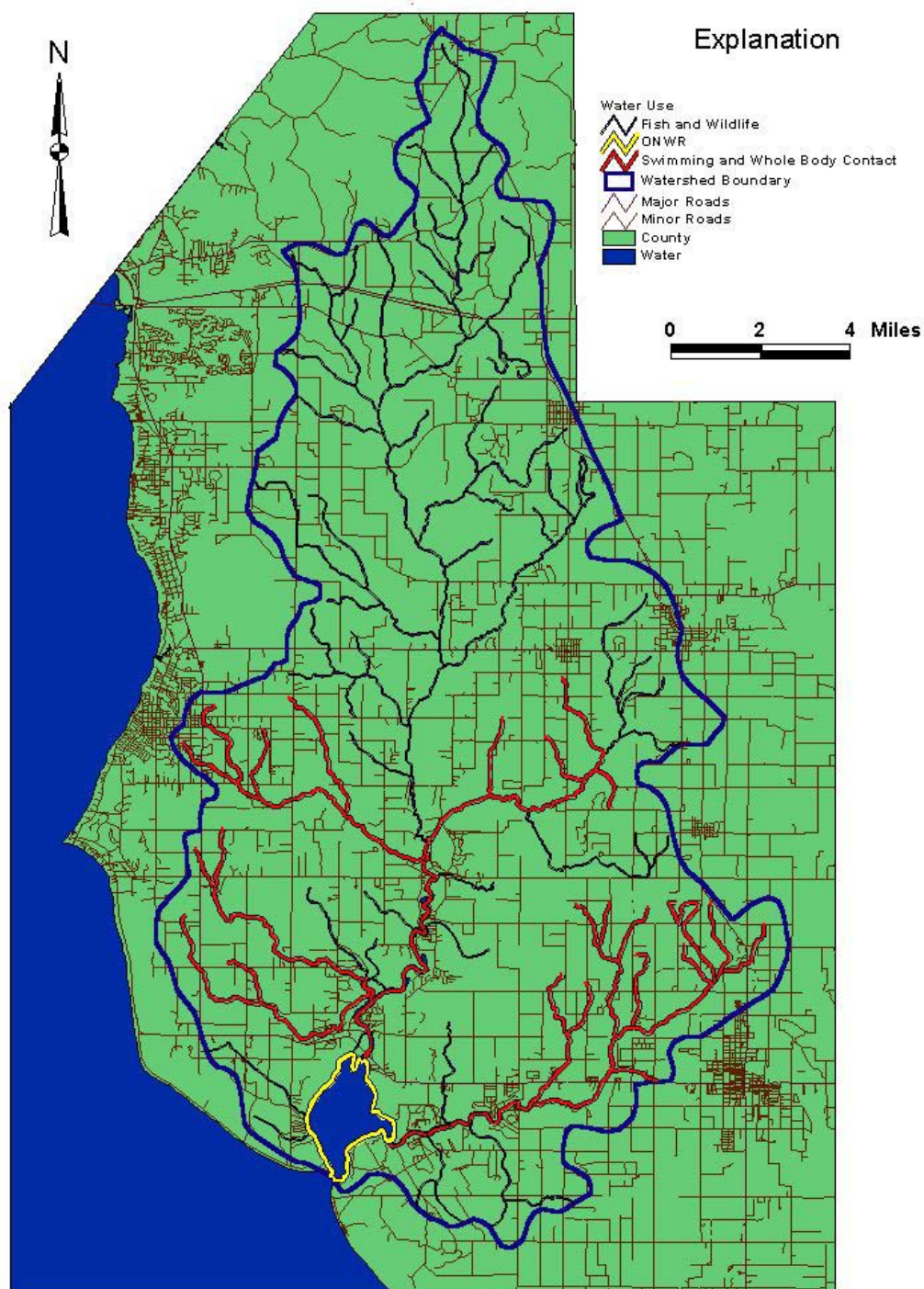


Figure 4. ADEM Water Use Classification for Weeks Bay Watershed

Citizen water quality monitoring began in April 1995. Currently, 28 sites are monitored bi-weekly by Weeks Bay Water Watch volunteers under the Alabama Water Watch program. Citizens monitor water pH, dissolved oxygen, turbidity, alkalinity, hardness, and temperature. Some citizens also monitor for the presence of *E. coli*. Volunteers are certified according to the EPA-approved *Alabama Water Watch Quality Assurance/Quality Control Plan*.

Scientific investigations and citizen involvement have revealed a number of problems in the Watershed. The primary environmental problems are decreased fish and shellfish production, threats to human health, habitat and resource loss, and increased flooding.

Specific contributors to each problem are discussed below:

A. Decreased Fish and Shellfish Production

1. Sedimentation in Weeks Bay adversely affects fish and shellfish production areas (submerged grassbeds) and navigation.
2. Low dissolved oxygen (DO) during low flow conditions in rivers and creeks limits fish, crab and shrimp production.
3. High turbidity in Fish and Magnolia rivers adversely affects recreational use, fish and shellfish production, and aesthetic experience.
4. Excess nutrients create low DO, turbidity, and decreased fish and shellfish production.

B. Human Health Threats

1. Presence of fecal coliform bacteria in some rivers and creeks is potential threat to human health.
2. Metals in the water column, sediment and in fish tissue are potential threats to human health.
3. Pesticides and other organic chemicals in the Watershed ecosystem are potential threats to human health.

C. Habitat/Resource Loss

Loss of fish and wildlife habitat, including submerged grassbeds, fringe marsh, other wetlands and upland forest reduces diversity and abundance.

D. Flooding

1. Loss of natural filtration system and floodwater reduces water retention provided by wetlands and forests.
2. Rapid runoff of stormwater from impervious surfaces results in increased flooding, sedimentation, litter and contaminants.

A. Decreased Fish and Shell Fish Production

1. Sedimentation in Weeks Bay Watershed adversely affecting fish and shellfish production areas (submerged grassbeds) and navigation.

Sediment, resulting from land erosion, is the most abundant pollutant in terms of quantity produced. The problems caused by erosion are compounded by unusually long slope lengths and intensive rainfall. Sheet and rill erosion is occurring on the 50,000 acres of cropland at an average rate of about 7 tons per acre annually (Baldwin County Conservation Needs Assessment, 1998). About 300,000 tons of soil are eroding from cropland each year because of sheet and rill erosion. An estimated 15 percent of the sediment, or 45,000 tons, moves into streams. About half of this amount, or 22,500 tons eventually reaches Weeks Bay. Additional sediment is coming from an undetermined amount of gully erosion [Baldwin County Soil and Water Conservation District (SWCD) unpublished report 1993].

One of the factors contributing to sedimentation is the abundance of the cropland has no runoff controls. Many farmers in the Watershed do not participate in USDA programs and, therefore, are not subject to conservation compliance provisions of the 1985, 1990, and 1995 Farm Bills. A considerable amount of the cropland is relatively flat and there is an unfounded belief among many landowners that these acres are not eroding excessively. Several other factors including low cost-share rates of existing conservation programs, low maximum cost-share ceilings, and extreme independence of some farmers, also contribute to the limited number of runoff control systems.

Unpaved roads are another contributor of sediment to surface waters and wetlands in the Watershed. There are approximately 150 miles of county-maintained unpaved roads in the Weeks Bay Watershed. Many of these roads wash out during heavy rain events, subsequently requiring regrading and resurfacing with clay hauled in from clay pits. Clay particles from eroding dirt roads can remain in suspension for long periods of time and contribute to increases in turbidity, oxygen depletion, and habitat modification.

Sod farming, an activity increasing in Baldwin County and within the Watershed, contributes sediment to wetlands and waterways. A total of approximately 20,000 acres are currently in sod production. Sod

farms are irrigated regularly and often. Over watering may result in additional runoff. When sod is harvested, large unvegetated areas are subject to erosion by wind, precipitation and irrigation runoff from adjacent cultivated fields until sod is reestablished. Soils on sod farms become compacted over time through the action of heavy farm equipment. The compacted ground surfaces are quite impervious to water penetration and cause an increase in irrigation and rainfall runoff. In addition, with impervious ground surfaces come increased sediment flow into stream systems, increased flooding, decreased groundwater recharging and degraded wetland and aquatic habitat.

The longstanding practice of denuding land for residential, commercial, or agricultural development, without effective erosion controls, contributes significant amounts of sediment to the wetlands and streams of the Weeks Bay Watershed.

Finally, an often-overlooked source of sedimentation is streambank erosion caused by the energy of wave action generated by boat wakes. This is an evolving problem and was of little significance until recent years. However, the rapid increase in population of the county and the attractiveness of the river systems for recreational purposes has led to dramatic, ever increasing boat traffic, including personal watercraft, on streams of the Watershed. Except in areas legally designated as a "No Wake Zone," little has been done to regulate the damaging effects of boat wakes on stream banks. As a consequence, owners of waterfront property are being forced to build bulkheads to protect their shorelines from erosion with a resulting loss of riparian habitat so vital to the health of the aquatic ecosystem. In the absence of a well developed cooperative educational and regulatory program, it can be predicted that major portions of the streams within the Watershed will become enclosed and suitable only for boating. Regulation of boat traffic is exclusively the jurisdiction of the Alabama Marine Police, a division of ADCNR. The Marine Police have no designated responsibility in environmental issues.

Accumulations of sediment can hinder navigation. Areas with impaired navigability occur in portions of Fish and Magnolia rivers as well as in the channel in Weeks Bay, reportedly due to drastic changes in bottom depth. The effects of accumulated sediment to Weeks Bay have not been well documented, but it is known that pesticides and nutrients, used in normal farming and landscaping operations, can attach to soil particles and be transported to surface waters. Some pesticides and nutrients can remain in solution and move through a water system. Some of these chemicals are harmful to fish, wildlife and humans. Excessive nutrients have been documented in Weeks Bay Watershed surface waters and may contribute to low dissolved oxygen and increased water turbidity

during spring and summer months. The need to protect Weeks Bay from sedimentation is of major importance.

2. Low DO during low flow conditions in rivers and creeks limits fish, crab and shrimp production.

DO content is a widely used water quality indicator because it regulates individual and ecosystem-level metabolic processes. Water temperature, photosynthesis and respiration processes, and the physical effects of wind and stream aeration markedly affect DO levels. According to Alabama's Fish and Wildlife standard, DO concentration should not fall below 5.0 mg/L. Low DO levels occur primarily during the summer and fall months in the Weeks Bay Watershed tributary streams and to lesser extent in the Fish and Magnolia rivers. These sites usually are characterized by swampy conditions and low stream flow. Sites in the Watershed where GSA and Weeks Bay Water Watch have documented single-sample water DO below the F&W standard of 5.0mg/L are listed in Table 4. Stream reaches where GSA has found DO below the F&W standard between January 1994 and November 1997 are depicted in Figure 5.

3. High turbidity in Fish and Magnolia rivers adversely affects recreational use, fish and shellfish production, and aesthetic experience.

The reduced light penetration resulting from suspended matter can affect primary production in Weeks Bay. Water turbidity data indicate that reduced water clarity from sediment and organic material in the water column is a frequent and widespread problem in the Watershed. The F&W standard for turbidity is a greater than 50 nephelometric turbidity unit (NTU) increase above background turbidity levels.

GSA has documented a number of potential violations of turbidity in the Watershed, however none at a frequency of 10% or greater. The sites where turbidity violations have occurred are shown in Figure 6. These include Brantley Branch at CR 24, Polecat Creek at CR 9, and Pensacola Branch at CR 48 (Sites 5, 6 and 16 respectively). Weeks Bay Water Watch monitors test for turbidity using the Jackson method (Jackson Turbidity Units, JTU). There is no direct correlation between JTUs and NTUs; therefore citizen data cannot be used to identify potential turbidity violations according to Alabama water quality standards. However, citizens have located a number of sites where increased water turbidity has occurred above background levels. These include: Unnamed Tributary 300 yd. west of CR 49 (V7-A), Weeks Creek near mouth (V8), Subdivision (V3), Magnolia River at CR 49 (V7), near mouth of Eslava Creek near mouth (V13),

Table 4. Greater Than 10% Potential Water Quality Violations of Fish and Wildlife Standard for Dissolved Oxygen in Weeks Bay Watershed.

Data Collector	Site Code	Location	# Violations	# of Samples
Geological Survey of Alabama¹	3	Turkey Branch at County Road 27	10	15
	5-A	Baker Branch at County Road 55	8	45
	12	Magnolia River at County Road 49	9	48
	13	Weeks Creek at County Road 26	39	48
	14	Schoolhouse Branch at Highway 98	24	48
	15	Brantley Branch at County Road 24	19	48
	17	Barner Branch at County Road 9	9	48
	18	Waterhole Branch at County Road 27	27	48
Weeks Bay Water Watch²	V2	Turkey Branch at County Road 27	6	9
	V5	Fish River at Highway 90	6	20
	V7	Magnolia River 30 yards east of County Road 49	7	47
	V7A	Magnolia River 300 yards west of County Road 49	6	46
	V10	Nolte Creek south of County Road 26	11	40
	V11	Bay Branch at Highway 90	3	7
	V18	Cowpen Creek at County Road 27	30	42
	V21	Silver Creek at Oscar J. Memorial Park	4	10
	V22	Fish River at Unnamed Tributary near Ridge Rd.	2	12
	V23	Fish River at County Road 48	2	6
	V26	Weeks Creek at Bay Road East	31	56
	V27	Fish River at Highway 59	3	10
	V37	Waterhole Branch at end of Danne Road of CR 32	5	33
	V39	Barner Branch at Weeks Marina	1	8
	V44	Boat ramp at north side of entrance to Weeks Bay	1	8
¹ Jan, 1994- Dec, 1998				
² Apr, 1995- May, 2000				

Fish River at CR 54 (V15), Perone Branch at CR 54 (V16), Fish River at CR 48 (V23), and Weeks Creek at Bay Road (V26).

4. Excess nutrients create low dissolved oxygen, turbidity, and decreased fish and shellfish production.

A proper balance of nutrients is critical to the ecological health of estuarine systems such as Weeks Bay. The two most important nutrients, in terms of water quality, are nitrogen and phosphorus.

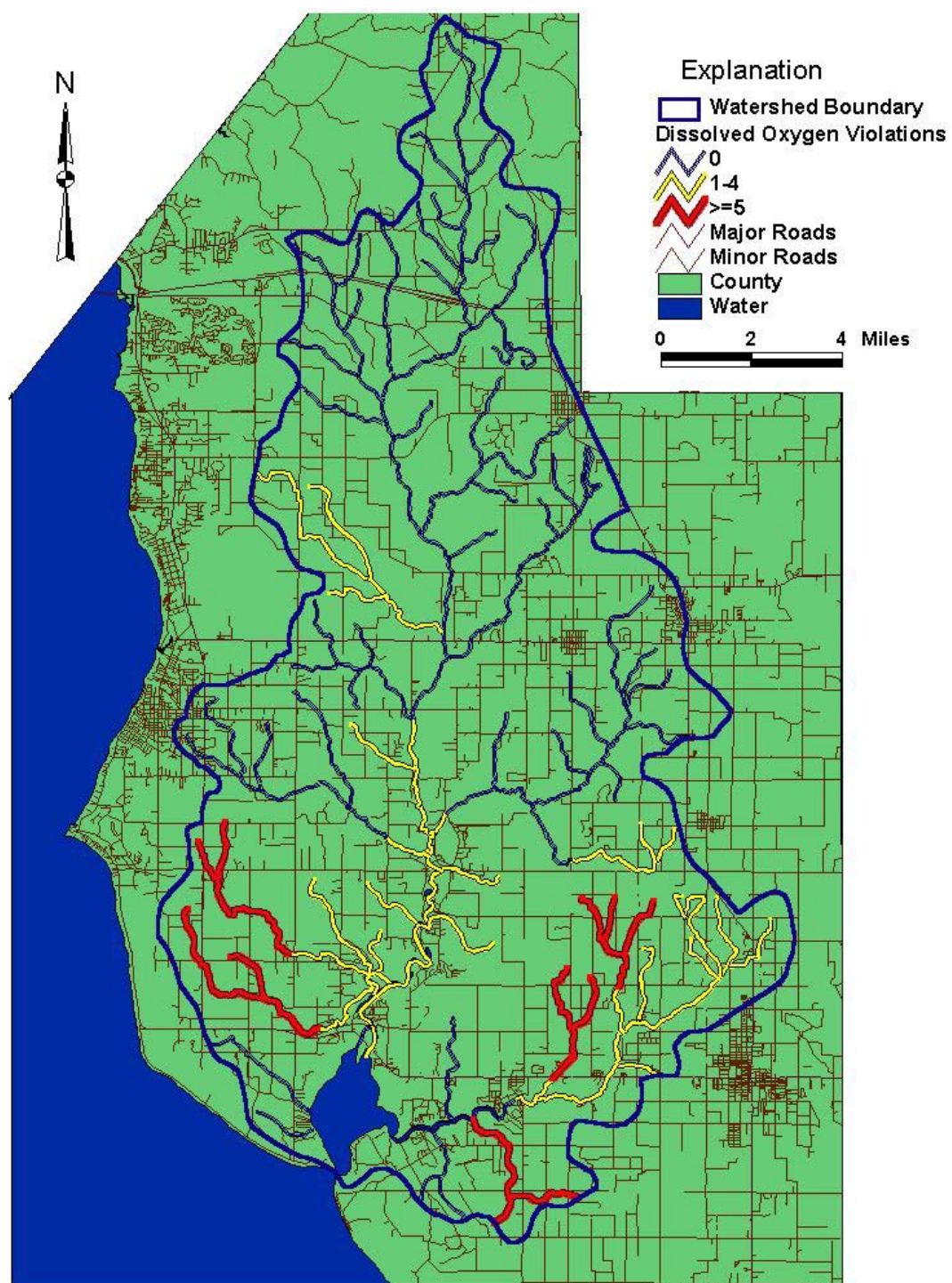


Figure 5. Possible Violations of Fish and Wildlife Standards for Dissolved Oxygen Content of Surface Waters of the Weeks Bay Watershed.

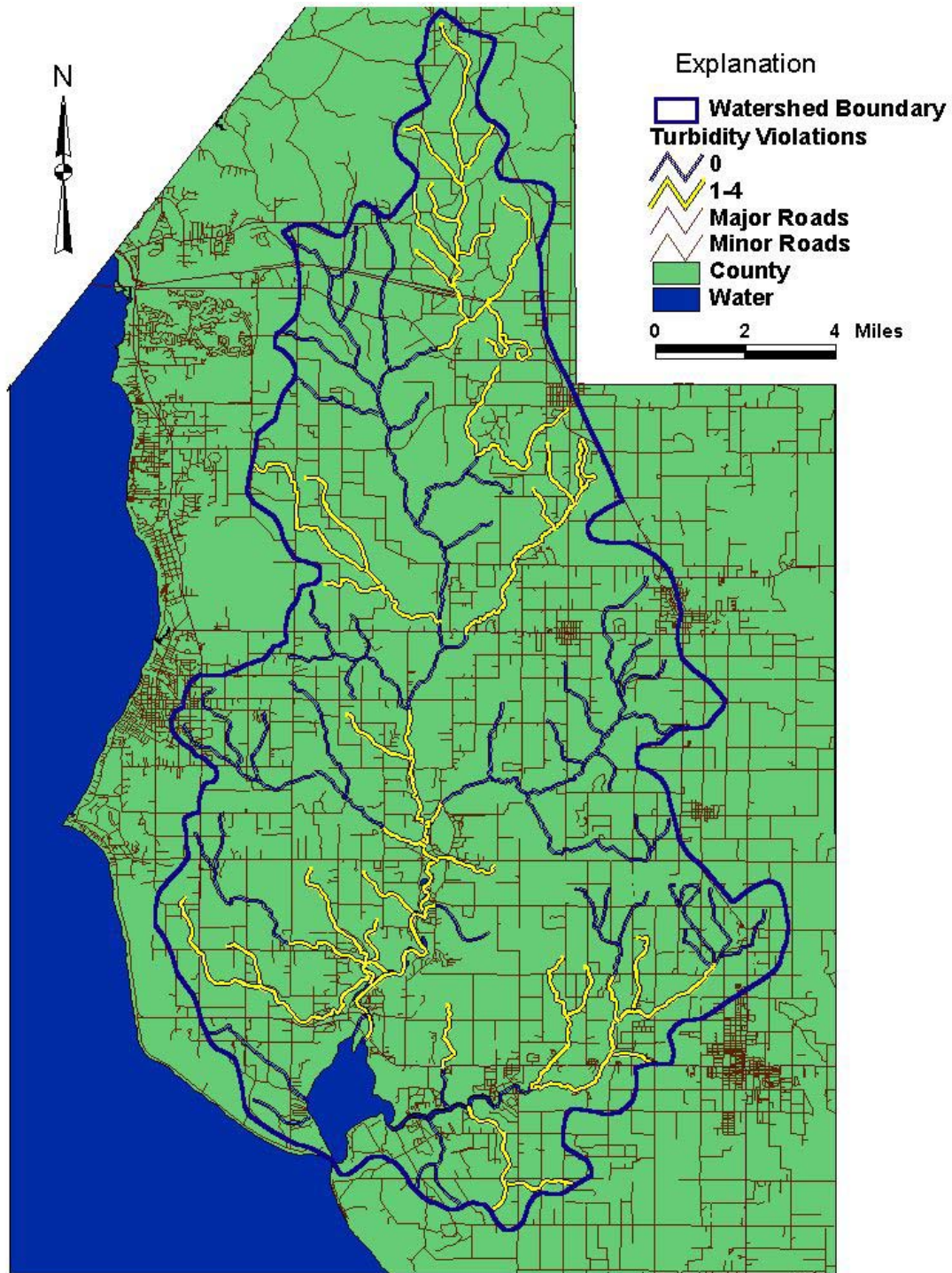


Figure 6. Possible Violations of Fish and Wildlife Standards for Turbidity Content of Surface Waters of the Weeks Bay Watershed.

Typically, these nutrients control biological production in aquatic ecosystems. Excessive nutrient loading in marine and brackish ecosystems can reduce water clarity, result in algal blooms, and negatively affect aquatic grassbeds. Input of these nutrients occurs most commonly via stormwater runoff containing fertilizers, septic effluent, and plant and animal wastes. Fertilizers applied to lawns, row crops, sod farms, orchards and forest areas can be a significant source of nutrients.

In a linkage model developed by Basnyat, et al. (1996) relating land use/land cover and nonpoint source (NPS) water pollution, the residential/urban areas in the Weeks Bay Watershed were identified as strong contributors of nitrate to streams. The second largest contributor was active agriculture. Modeling suggested that disturbances in areas close to or adjacent to streams have profound effects on water quality. Basnyat also suggested that forests act as a nitrate sink. As the proportion of forests inside the contributing area increases, nitrate concentrations decrease in receiving streams.

Excessive amounts of nitrate have been documented in streams throughout the Watershed. Although there are no Alabama water quality standards for nutrients, nitrate values above 1.0 mg/L and phosphate values of greater than 0.1 mg/L can be of concern because of a possible association with excessive growth of aquatic vegetation. The GSA has recorded mean nitrate values greater than 0.750 mg/L at a number of locations in the Watershed. These are listed in Table 5.

Table 5. Sites Where Mean Nitrate Values Exceed 0.75 mg/L, Jan, 1994-Dec, 1998.

Data Collector	Site Code	Location
Geological Survey of Alabama	2	Fish River at CR 48
	4	Cowpen Creek at CR 33
	6	Polecat Creek at CR9
	7	Perone Branch at Hwy 104
	8-A	Caney Branch near Hwy 104
	10	Corn Branch near Loxley
	12	Magnolia River at CR 49
	15	Brantley Branch at CR 24
	16	Magnolia River at CR 2
	17	Barner Branch at CR 9

Phosphate concentrations are usually less than 0.08 mg/L (the analysis' lowest detection limit) and are not of particular concern in Weeks Bay Watershed. However, phosphate concentrations over 0.1 mg/L have been measured several times in Weeks Creek at CR 26 in Magnolia Springs.

B. Human Health Threats

1. Presence of fecal coliform bacteria in some rivers and creeks is potential threat to human health.

Fecal coliform bacteria are normal inhabitants of the intestinal tract of all vertebrate animals. Their presence in surface or ground water indicates contamination of these waters by animal waste, human, domesticated or feral. They may reach surface waters directly from the outfall of a wastewater treatment facility, from pleasure or commercial boats, from surface water runoff, usually associated with heavy rainfall or from concentrations of domestic animals in or nearby streams.

The presence of fecal coliform bacteria in surface waters of the Weeks Bay Watershed has been documented many times. A major problem exists in determining the source of the pollution, whether from human or animal waste. Sandy soils and a high ground water table in much of the Watershed make effective on-site wastewater treatment problematic in those areas. It has been estimated that approximately 90 percent of the households in the Watershed rely on septic tanks for wastewater treatment. At this time, no practical method to determine how many septic tank systems are effectively treating household wastewater is available.

In Weeks Bay Watershed, except during periods of excessive runoff, fecal coliform counts for Fish River, Magnolia River and Weeks Bay are consistently low. In contrast, streams in the upper Watershed areas display more significant coliform counts. Table 6 lists violations of the F&W fecal coliform single-sample count (2,000 colonies per 100 ml sample) standard that occurred at 10 percent or greater (five violations or more) sampling events as documented by the Geological Survey of Alabama. These stream reaches are shown in Figure 7.

Weeks Bay NERR volunteers monitor for the presence of fecal coliform bi-weekly at five sites in the Watershed. Water samples are collected by volunteers and delivered to ADEM's Mobile Field Office for analysis. Results of monitoring by WBNERR indicate that violations have occurred during 10% or more of the sampling events in Corn Branch at CR 64 and in Turkey Branch east of CR 27.

Table 6. Greater Than 10% Potential Water Quality Violations of Fish and Wildlife Standards for Bacteria in Weeks Bay Watershed.

Data Collector	Site Code	Location	# Violations	# of Samples
			Fecal Coliform	
Geological Survey of Alabama¹	8-A	Caney Branch near Highway 104	9	58
	9	Fish River at Highway 90	5	59
	10	Corn Branch at County Road 64	6	59
	13	Weeks Creek at County Road 26	5	48
Weeks Bay Water Watch²			# Violations	# of Samples
			<i>E. coli</i>	
	V5	Fish River at Highway 90	1	5
	V7	Magnolia River 30 yards east of County Road 49	1	6
	V15	Fish River at County Road 54	1	11
	V16	Perone Branch at County Road 54	2	12
	V18	Cowpen Creek at County Road 27	1	6
	V26	Weeks Creek at Bay Road East	2	12
	V36	Weeks Bay at Bay Haven subdivision	1	11
¹ Jan, 1994- Dec, 1998, Fecal Coliform enumeration by Membrane Filtration, SM9222D, 19th Edition.				
² May, 1999- May, 2000, <i>E. coli</i> enumeration by COLISCAN EASYGEL (Micrology Labs, Goshen, IN)				

Weeks Bay Water Watch volunteers test for *E. coli* at 12 sites in the Watershed. Because ADEM uses fecal coliform testing as an indicator of bacterial water quality, the volunteer *E. coli* enumerations cannot be used to monitor potential violations. The Weeks Bay Water Watch data are used to officially identify areas of possible bacterial contamination in the Watershed. The EPA recommends 250 colonies per 100 ml sample limit for *E. coli* for states that utilize *E. coli* as the bacterial indicator for Alabama water quality standards. Table 6 shows seven sites where Weeks Bay Water Watch volunteers have documented *E. coli* concentrations greater than 250 colonies per 100 ml.

2. Metals in the water column, sediment and in fish tissue are potential threats to human health.

The potential sources of metal enrichment within the Weeks Bay Watershed include but are not limited to, day-to-day operation of

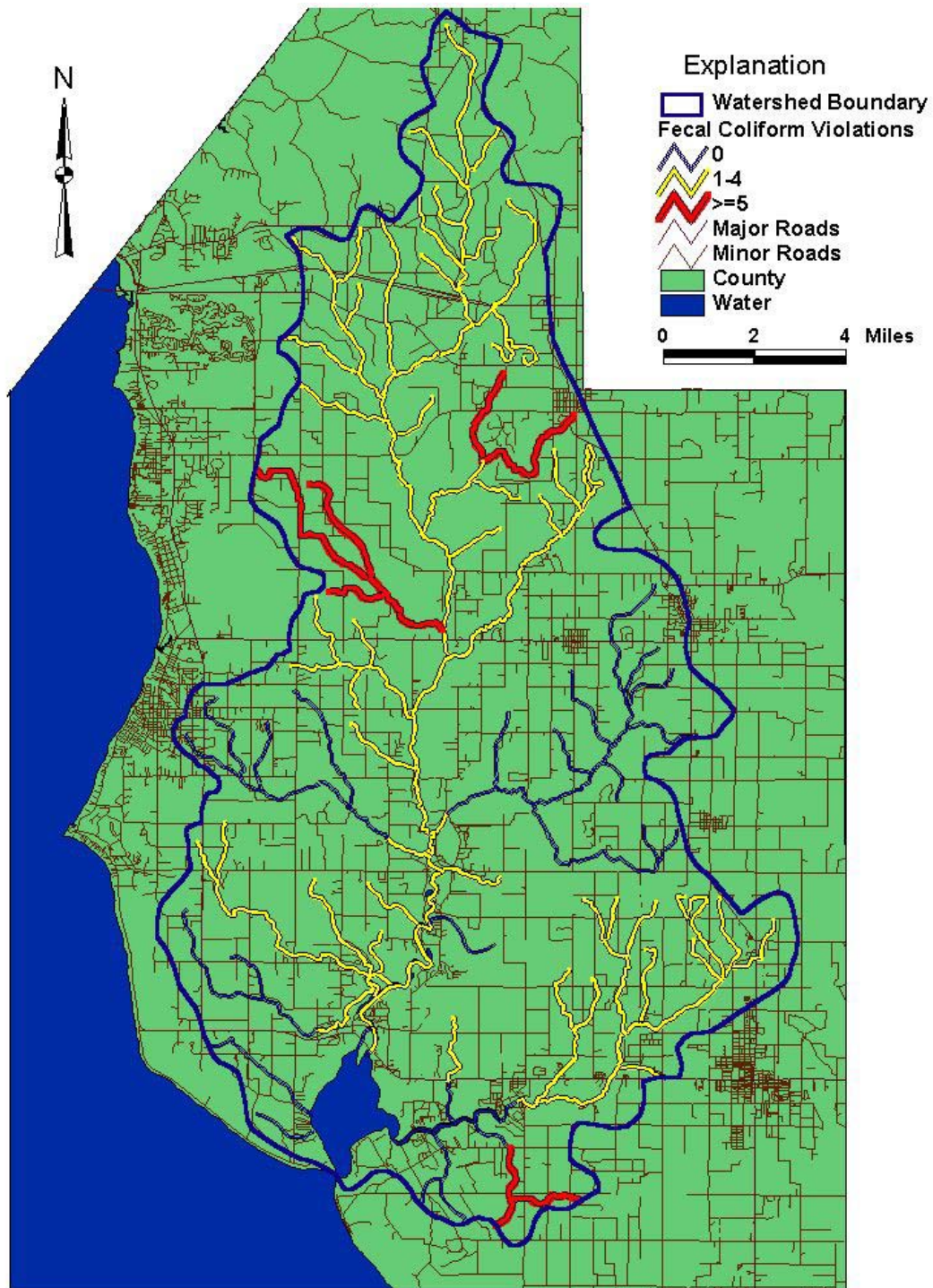


Figure 7. Possible Violations of Fish and Wildlife Standards for Fecal Coliform Numbers in Surface Waters of the Weeks Bay Watershed.

motor vehicles and breakdown of surface coatings such as marine paints used by boaters and commercial fishermen. Metals (e.g., arsenic, cadmium, lead and copper) are all used extensively in agricultural practices (Weber et al. 1992). Mercury, cadmium, and lead are considered to be the metals most dangerous to human and ecosystem health. However, copper, zinc, silver, and chromium also pose significant threats to the environment (Forbes and Forbes 1994).

In 1991, ADEM reported metal concentrations in sediments from 53 stations located around coastal Alabama. Of these stations, one was located in Weeks Bay and another was located in Fish River. Overall, metal concentrations in these sediment samples were low.

Comparisons of the concentration data with aluminum to metal ratios suggest that sediment metal concentrations in Weeks Bay and Fish River are within the range of natural variability observed in coastal waters. Of the eight metals examined, only barium in samples collected from Fish River was found to exceed the range of natural variability observed in coastal Alabama (from Valentine and Lynn 1996).

In October 1995, ADEM (Fish Tissue Monitoring Program, ADEM Letter Report, 1996) reported mercury contamination in largemouth bass collected at the confluence of Fish River and Polecat Creek. The mercury concentration was 1.29 ppb in a composite largemouth tissue sample. The finding led the ADPH to issue a public health advisory for consumption of largemouth bass from Fish River. The sampling was repeated in April 1997 at two sites in Fish River, the original site at the confluence of Fish River and Polecat Creek and a second site located approximately two miles upstream of U.S. 98 bridge near the confluence of Fish River and Waterhole Branch. Also, Magnolia River was sampled approximately 2.5 miles upstream of Weeks Bay, just upstream of Weeks Creek confluence. Other sites in coastal Alabama rivers were included in the sampling program. Fish tissue samples were taken from catfish, speckled trout and largemouth bass. Again, only largemouth bass from Polecat Creek sample (1.04 - 1.46 ppb) yielded mercury concentrations above the U.S. Food and Drug Administration guideline of 1.0 ppb.

3. Pesticides and other organic chemicals in the Watershed ecosystem are potential threats to human health.

Chlorinated hydrocarbons are used in a variety of agricultural and industrial applications. Two such groups of chlorinated compounds present within the Weeks Bay system are polychlorinated biphenyls (PCBs) and pesticides. The input of PCBs to the environment can result from municipal wastewater and industrial effluents, the

treatment of wastewater sludge, atmospheric deposition and leachates from landfills. Low levels of the metabolites of DDT, DDE and DDD in oysters collected at the mouth of Weeks Bay were reported in 1969 (May 1971).

Pesticide concentrations and PCB presence have been described by Drs. Tom and Judy Lytle (Gulf Coast Research Laboratory) in an ongoing EPA surface-water study and in a study conducted by Dr. W. Schroeder (Dauphin Island Sea Lab). The Lytles compared water column and sediment test results with EPA Water Quality Criteria and found no evidence for concern in Weeks Bay and lower Magnolia River. Concentrations in Weeks Bay sediments reported by Schroeder were low for most contaminants.

C. Habitat/Resource Loss

Loss of fish and wildlife habitat, including submerged grassbeds, fringe marsh, other wetlands and upland forest reduces diversity and abundance.

Areas inland, in wetlands, along shorelines and in waterways throughout the Watershed provide habitat for many plant, fish and wildlife species. Loss of this habitat, whether by degradation or destruction, reduces diversity and abundance of natural species. Development reduces habitat by converting the land to the others uses. The Baldwin County Long Range Development and Management Plan Situation Analysis (SARPC 1993) points to the likelihood that residential growth will increase, especially along the water bodies, for the area of Baldwin County that includes the Weeks Bay Watershed.

Historically, low population density and resource use have minimized habitat loss and pollution problems in the Watershed. However, as population in the area increases, the threat of habitat destruction will increase as well. In addition to rapid population growth, commercial growth is occurring rapidly in this area, especially along transportation arteries. A comparison of past and future land use requirements for Baldwin County, as illustrated in the County Long Range Plan (SARPC 1993), indicates that residential, commercial, and industrial development is projected to increase nearly 40 percent between the years of 1990 to 2010 (Table 2). The reduction of undeveloped land that had been prior wildlife habitat is a particular concern.

An estimated 3,000 acres of prior-converted cropland (farm wetlands converted to cropland) are located within the project area. The loss of these wetlands and their associated water quality functions have contributed to degradation of the Fish and Magnolia rivers and many

of their tributaries as well as Weeks Bay. The reduction of water quality reduces an area's ability to support plant and wildlife populations.

New residential construction penetrating throughout the Watershed poses the greatest threat to fish and wildlife habitats. Where and how construction occurs has direct implications to water and habitat quality and quantity. Waterfront development and bulkhead placement along shoreline areas reduce riparian vegetation, which plays an important role in reducing turbidity by trapping sediment, providing thermal cover to prevent water temperature extremes, and taking up excess nutrients that may be present in runoff. Shoreline vegetation absorbs wave energy and reduces erosion. Flood plain vegetation reduces the height and velocity of floodwaters. Ultimately, decreases in overall water quality renders areas unfit for use by plant, fish and wildlife species as habitat.

Reduced light penetration, caused by increased turbidity in the water column, may limit submerged aquatic vegetation (SAV) growth in Weeks Bay. In 1981, Stout and Lelong located only two small patches of SAV, less than an acre each, in Weeks Bay. These SAV patches are located near the mouth of the bay at Muddy Bayou to the west and near a small unnamed creek just inside Weeks Bay to the east. The SAV species present were mostly freshwater aquatics (*Vallisneria americana*, *Myriophyllum spicatum* and *Potamogeton pectinatus*), except for the brackish widgeon grass (*Ruppia maritima*). These SAV patches were not observed in a 1995 survey (L.G. Adams, personal communication). Although SAV habitats are ephemeral, the lack of recovery or establishment of new grassbeds in Weeks Bay is of major concern.

D. Flooding

1. Loss of natural filtration system and floodwater retention provided by wetlands and forests.

Wetlands play an important role in reducing flood potential in a Watershed. Wetlands and riparian buffers are capable of soaking up vast quantities of water and gradually releasing it as the water table lowers.

According to the 1988 National Wetlands Inventory maps, the Weeks Bay Watershed contains 12,170 acres of aquatic bed, marsh, bottomland forest, and freshwater wetlands, comprising approximately 10 percent of the Watershed. It is estimated that within the Watershed approximately 5,000 acres of wetlands have been lost or altered due to residential development and agricultural uses (habitat loss estimates provided by SARPC and NRCS in 1997).

The flood storage capacity lost from wetland alteration is believed to be significant.

2. Rapid runoff of stormwater from impervious surfaces results in flooding, sedimentation, increased litter and contaminants.

Stormwater run-off from impervious surfaces greatly increases the volume and rate of water discharge. Impacts downstream can be devastating. Flooding produced by Hurricane Danny in 1997 caused millions of dollars in damage in the Fish River Watershed. Watershed-wide efforts such as land protection and riparian vegetation restoration may help minimize such damage caused by rapid runoff in the future.

IV. CURRENT MANAGEMENT METHODS

The methods currently in use or available for use in the Weeks Bay Watershed include both regulatory and non-regulatory approaches. Regulatory methods utilize legal means and administrative rules established by Federal, State and local laws and codes. For certain activities or development in the Watershed, permits issued by the appropriate regulatory agency like ADEM or COE are required for initiation and completion of the projects. In some instances, a period of public comment on the project plan is included as part of the permitting process. Also, some permits require effluent discharged as part of a project's operation or stormwater site runoff be monitored for water quality. The results of the monitoring is a matter of public record and available for examination.

The non-regulatory methods involve public and private management tactics. Incentive programs offered by government agencies provide money on a grant or cost-share basis to assist management programs. Also, tax incentives are available that reduce the tax burden on property within the Watershed that is managed in an environmentally sound manner. Two other important management tools include private stewardship and citizen involvement. No regulation takes the place of property holders on their own employing BMPs on land within the Watershed. Likewise, concerned citizens joining together for a common cause are able to influence other citizens and government activities.

A. Regulatory

1. National Pollutant Discharge Elimination System Permits

The National Pollutant Discharge Elimination System (NPDES) was established by the Federal Water Pollution Control Act (1972) to control point source discharges to streams. In Alabama, this program is administered by the ADEM. This permitting system sets effluent limitations for discharges of treated municipal, industrial, and mining wastes. Also, construction sites over five acres in size are included under the mining provisions of this program. Effluent limitations specify the level of wastewater treatment required prior to its discharge into a stream. Permittees are required to submit discharge monitoring reports (DMR) to ADEM. The DMR contains data for all parameters and monitoring frequency specified by the NPDES permit. In addition, the Mobile Area Municipal Separate Storm Sewer System NPDES Permit will require construction sites over one acre.

2. Nonpoint Source Discharge Regulations

The U.S. Congress enacted Section 319 of the Clean Water Act in 1987 to provide for assessment of the degree and nature of water quality impacts due to NPS water pollution and to provide for

implementation of programs to deal with NPS water pollution. ADEM is responsible for the administration of Section 319 in Alabama. This responsibility involves the use of funds for NPS pollution education and demonstration projects. There are no present limitations for NPS pollution discharges. The responsibility of NPS pollution education and control lies within the agencies that oversee the activities of each NPS category. The Alabama Forestry Commission is responsible for conducting compliance inspections on forestry sites and the NRCS is responsible for NPS control on agricultural lands. Stormwater permits for municipalities come under the authority of ADEM's Municipal Branch; industrial wastewater discharge falls under the authority of ADEM's Industrial Branch.

Although there are no effluent limitations for NPS discharges and BMP implementation is voluntary, ADEM may take enforcement action on any site or activity where discharges result in a water quality violation in waters of the State.

3. Army Corps of Engineers Regulatory Programs

Wetlands are considered one type of "waters of the United States" that are protected from unauthorized discharges of dredged or fill material under Section 404 of the Clean Water Act. The purpose of Section 404 is to protect and enhance water quality by regulating the discharge of dredged or fill material into wetlands. EPA and the Army Corps of Engineers (COE) jointly define wetlands as:

"..those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." (EPA 40 C.F.R. § 230.3 and COE 33 C.F.R. § 328.3)

The Section 404 regulatory program authorizes the COE to issue permits, after public notice and opportunity for public comment, and take enforcement action for unauthorized activities in wetlands and other U.S. waters.

The Rivers and Harbors Act (1899) was originally enacted primarily to protect and promote water navigation for commerce. Jurisdiction under the Rivers and Harbors Act is based on the "navigability" of a water body. The jurisdiction extends laterally over the surface of ordinary high-water mark for nontidal areas and the mean high water mark for tidal areas. The regulatory definition of navigable waters of the United States is:

“Those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use, to transport interstate or foreign commerce.” (33 C.F.R. § 329.4)

Section 10 of the Rivers and Harbors Act of 1899 prohibits the unauthorized obstruction or alteration of any “navigable water of the United States” except by permit from the COE. Regulated activities include dredging, placement of dredged or fill material, and construction in or over navigable waters.

4. Health Department Septic Tank Permits

The Baldwin County Health Department requires a permit for the installation of onsite sewage disposal systems (OSDSs). The most common conventional OSDS is the septic tank, which is used extensively in the Weeks Bay Watershed to treat and dispose of household and business septic waste. The permit is based upon an approved soil percolation test. A registered engineer or land surveyor must conduct the percolation tests. On limited sites, where a problem with soils, such as a shallow water table or clay layer, requires the installation of an alternative OSDS, percolation tests and system design must be done by a registered engineer and must be approved by the health department. The typical method for identifying on-site system malfunctions is through complaints to the county health department. County health environmentalists investigate complaints to determine the type of malfunction, degree of contamination, and proper remedial action.

5. Sanitary Sewer Districts

Sanitary sewer districts can be formed on the basis of judicial districts, topography, number of households or other site characteristics and are intended to provide specific regulatory oversight in areas susceptible to on-lot septic system failures or malfunctions. Although the enabling legislation is in place in Alabama, as of yet none have been successfully established. Sanitary districts are established to assist the ADPH and the county environmentalists in reviewing, monitoring and repairing onsite systems. Sanitary districts typically use a variety of funding tools such as local taxation, special assessments, grants and loans to implement septic system maintenance, inspection, and educational programs.

6. Zoning

Currently, there are a total of 11 planning districts in the Watershed. Only one planning district that includes the southeast shore of Weeks Bay has adopted zoning. The Baldwin County Commission (BBC)

has developed subdivision regulations (July 1996) which apply to “the division of a lot, tract, or parcel of land into two (2) or more lots, plats, sites, or other division of land for the purpose, whether immediate or future, of sale or of building development.”

Subdivision regulations were revised in 1998. Any construction activity in the county also requires a building permit.

B. Non-Regulatory

1. Incentive Programs

Cost-share incentive programs appear to be the most effective way to achieve landowner cooperation in the Watershed, particularly in the area of wetland restoration. Most landowners do not have the funds or initiative to undertake a project of such magnitude on their own.

a. Conservation Reserve Program (CRP)

This USDA program, administered by NRCS, was established as a conservation provision of the Farm Bill to encourage and assist farm producers willing to set aside highly erodible, riparian, and other environmentally sensitive lands from crop production for a 10 or 15 year period. Producers may enroll in the CRP program according to USDA program rules. If a landowner’s CRP bid is accepted, a Conservation Plan of Operation is developed. In addition to an annual CRP payment, USDA will provide a 50% cost-share to establish the selected conservation practice. Landowners may receive a maximum of \$50,000 annually in CRP payments.

b. Wetlands Reserve Program (WRP)

This voluntary USDA program for restoring wetlands is administered by NRCS with technical assistance from the FWS. Participating landowners can establish conservation easements of either permanent or 30-year duration, or can enter into restoration cost-share agreements where no easement is involved. NRCS and FWS assist private landowners with site selection and development of restoration plans for the site. Up to 100% of the cost of restoring the wetland is provided by USDA.

c. Environmental Quality Incentives Program (EQIP)

This USDA program is administered by NRCS. EQIP works primarily in locally identified conservation priority areas where there are significant problems with natural resources. High priority is given to areas where State or local governments offer financial, technical, or educational assistance, and to areas where agricultural improvements will help meet water quality objectives. Landowners can apply to the program for assistance in solving problems related to animal waste management, erosion, and other environmental

problems. EQIP will provide up to 60% cost-share for restoration. A landowner may receive up to \$50,000 annually in EQIP payments.

d. Forestry Incentives Program (FIP)

Forestry Incentives Program is a USDA program administered by NRCS. FIP supports good forest management practices on privately owned, nonindustrial forestlands nationwide. FIP is designed to benefit the environment while meeting future demands for wood products.

e. Wildlife Habitat Incentives Program (WHIP)

The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for landowners who want to develop and improve wildlife habitat on private lands. Participants work with NRCS to prepare a wildlife habitat development plan. USDA provides technical assistance and cost-share payments up to 75 percent of the cost of installing the wildlife habitat practices. USDA and the participant enter into a cost-share agreement that usually lasts a minimum of 10 years.

f. Farmland Protection Program (FPP)

The FPP provides funds to help purchase development rights to keep productive farmland in agricultural use. Seventeen states are currently implementing the FPP program. Alabama is not currently implementing this program.

g. Partners for Fish and Wildlife

This incentive program is administered by FWS. The Partners for Wildlife program restores, improves, and protects fish and wildlife habitat on private lands through alliances between the FWS, other organizations, and individuals, while leaving the land in private ownership. Funds received cannot exceed \$10,000 during one fiscal year and projects with private landowners must secure a minimum 10-year habitat development agreement. Landowners can receive up to 100% funding for project expenses. The program emphasizes Federal trust resources: e.g. migratory birds, endangered and threatened species, wetlands, flood plains and riparian areas.

h. Weeks Bay Pollution Prevention Project (WBPPP)

The Baldwin County SWCD initiated the WBPPP in 1994. Funding for this program expired in September 1996. The EPA Gulf of Mexico Program funded the WBPPP. The grant funds were used to assist local landowners in implementing BMPs for the control of sediment, excess nutrients, pesticides and other nonpoint source pollution. This project provided technical assistance (information and education), equipment rental to assist in carrying out the practices, cost-sharing, and educational programs.

Some of the highlights of the WBPPP included:

1. Purchased a no-till grain drill that was used by local farms to implement conservation tillage.
2. Cost-shared 30,600 acres of conservation tillage in the Watershed during the life of the 3-year grant
3. Restored 20 acres of wetlands in the Weeks Bay Watershed.
4. Planted permanent vegetative cover on 150 acres of highly erodible land in the Watershed.
5. Constructed three outdoor classrooms at Daphne Middle School, Foley Middle School, and Robertsedale High School. Two acres of prior-converted wetland were restored at the Daphne Middle School site.
6. Funded (in part) a traveling cloth diorama of Weeks Bay. Instructional resource kits were also developed to travel with the project. This diorama is available to all schools in Baldwin County, as well as clubs, civic groups, and Boy and Girl Scout groups.
7. Purchased resurfacing materials and completed improvements on two dirt roads identified as contributors of sediment to Fish and Magnolia rivers.
8. Restored two abandoned dirt pits in the Watershed.

2. Private Stewardship

Given the opportunity, landowners will normally incorporate conservation practices into the management of their property. Most landowners are aware of water quality issues but may not have the information needed to minimize nonpoint source pollution. Information and education programs are an important part of any program that relies on private stewardship.

3. Tax Incentives

a. Conservation Easements

A conservation easement is a legal agreement that property owners may use to place development restrictions on a property. Each easement's restrictions are tailored to the particular property owner's needs and interests and may include limitations on the type or amount of development that may take place. These limitations may be used to protect conservation or historic resources on a parcel of land. If an easement donor wishes to claim tax benefits for the gift, he or she must donate it or sell it for less than fair market value to a public agency or to a conservation or historic preservation organization that qualifies as a public charity under Internal Revenue Code Section 501(c)(3). An easement may be perpetual or may be a term easement that is written for a specified period of years. Only

gifts of perpetual easements, however, can qualify a donor for income and estate tax benefits.

In order to qualify for IRS tax-deductibility, an easement must be given exclusively for conservation purposes. The IRS developed several resource categories for tax purposes. These include: Public Recreation and/or Recreation, Significant Natural Habitat, Open Space for Scenic Enjoyment, Open Space Pursuant to Government Policy, and Historic Preservation.

b. Gift of Remainder Interest

A gift of remainder interest is a charitable contribution of property to a public agency or a conservation or historic preservation organization that allows the owner the right to live on the property until death. Unlike a conservation easement, where the development rights to a property are donated, a donation of remainder interests will donate all or portions of the property itself to the charitable organization upon death of the owner.

c. Gift by Will (Testamentary Gift)

A charitable contribution of a conservation easement or an outright gift of property can be made by will. The full value of the gift is deductible from estate taxes.

4. Citizen Involvement

Watershed education initiatives play a role in energizing and organizing citizen activities. Information and education programs to encourage Watershed protection should be directed at a wide range of target audiences including agricultural producers, builders and contractors, school teachers, students, homeowners, business and community leaders as well as elected officials. Programs should be tailored to each group based on their unique informational needs. There are currently a number of programs in place for citizens to take an active role in protecting the Weeks Bay Watershed. These initiatives include Greener by the Yard, Adopt-A-Stream, Partners for Clean Water, Weeks Bay Water Watch, and the Citizen Advisory Committee.

V. STRATEGY FOR PROTECTION

The goal of the Weeks Bay Watershed Project is “to improve and maintain water quality in the Weeks Bay Watershed to meet or exceed Alabama water quality standards for waterbodies classified as Swimming and Fish and Wildlife.” Fourteen objectives have been developed to assist the Watershed Project in meeting this goal. The fourteen objectives have been divided into the following management categories: nonpoint source pollution, habitat protection and restoration, growth management and infrastructure, and management plan implementation and evaluation. A summary of the objectives follows:

A. Nonpoint Source Pollution

1. Reduce nonpoint source pollution from agricultural activities.
2. Reduce nonpoint source pollution from construction and land clearing activities.
3. Reduce nonpoint source pollution from residential sources.
4. Protect ground water resources through a reduction in nonpoint source pollution.
5. Reduce the pollution generated by water-related recreational activities, including sewage, petroleum products, and litter.
6. Continue Weeks Bay Water Watch monitoring and formally analyze data to identify trends and design recovery plans if necessary.

B. Habitat Protection and Restoration

Ensure protection of fish and wildlife habitat, including submerged grassbeds, fringe marsh, shorelines, and other wetlands and upland forest through land acquisition, education, and incentive programs.

C. Protection, Growth Management and Infrastructure

1. Reduce pollution from existing and future on-site sewage systems.
2. Promote planning and zoning that will protect environmentally sensitive areas.
3. Identify unpaved roads that contribute sediment to the Watershed and work with the county government to develop a plan to improve these roads within a reasonable time frame.
4. Reduce water pollution from urban stormwater discharge sources, including residential subdivisions and commercial areas.

D. Management Plan Implementation and Evaluation

1. Establish and maintain a system of priorities for academic research in addition to volunteer monitoring that will:
 - a) contribute to the understanding of watershed conditions and processes, such as land use changes, habitat loss, and peak and minimal flows;
 - b) assist in the establishment of trends in physical, chemical, and biological water quality parameters for surface and ground water; and
 - c) provide transfer of technical and scientific information to aid decision-making activities of regulatory and management personnel.
2. Develop long-term support and involvement of Watershed residents through the leadership of CAC and Watershed Project Coordinator on Watershed planning and management activities.
3. Cooperate and partner with other Federal, State, and local agencies to achieve the strategies described herein.

The objectives and strategy have been developed with assistance from technical experts and the CAC. The recommendations made in this report are based on water quality data, land-use and land-cover information and best professional judgment of staff of the ADCNR State Lands Division, GSA, NRCS, ADEM, FWS, ADPH, ACES, DISL, and WBNERR.

Each section that follows includes specific and measurable strategies, a discussion of each strategy, responsible parties and cooperators, potential funding sources, and a schedule. The strategies for each objective are listed in sequential order and should be viewed as a series of steps needed to accomplish the overall objective.

Responsible parties are those agencies with regulatory or legal authority or a vested interest in the strategy. Cooperators are those who could assist the responsible parties through shared resources and/or technical input. Potential funding sources identifies grant programs where funds may be pursued, however, the list is not comprehensive. The schedule identifies which quarter of which year the activity will be initiated. The strategies, responsible parties, cooperators, funding sources and schedules are recommendations only and are dependent on available funding resources and local support. As stated, the overall purpose of the following management objectives and strategies is to coordinate and better utilize existing Federal, State and local resources to improve and maintain water quality in Weeks Bay.

A. NONPOINT SOURCE POLLUTION

1. Reduce nonpoint source pollution from agricultural activities.

Strategy:

- a. *Identify and prioritize subwatersheds that are most affected by agricultural nonpoint source pollution*

Discussion: Evaluate water quality data to identify stream reaches that do not meet water quality standards in the Watershed. Utilizing aerial photography, farm plans, and other resources to identify types of agricultural activities, animal numbers, proximity to streams, etc. to evaluate potential effects on streams. Identify stream reaches adversely affected by agricultural activities and the types of activities detrimental to water quality.

Responsible Parties: NRCS, ACES

Cooperators: GSA

Potential Funding: No additional funds necessary

Schedule: First quarter 2001

Progress: The Alabama Natural Heritage Program compiled a Nonpoint Source Prioritization Project and Site Conservation Plan for the Weeks Bay Watershed completed in spring of 2000. ADEM has identified 303(d) streams in several watersheds. As part of a research effort in 1999-2000 at WBNERR, a graduate student has examined land use changes in Weeks Bay Watershed over the past decade. In June, 2001, the South Alabama Geospatial Data User Group (SAGDUG) met in Mobile. SAGDUG is made up of more than 30 local, State and Federal groups that have combined GIS data sources about south Alabama. The Watershed Project will have access to the GIS data upon request through WBNERR.

- b. *Involve the Watershed agricultural community in Watershed planning activities and encourage the establishment of voluntary goals for BMPs within the Watershed.*

Discussion: Attend meetings of local farm groups, including South Baldwin Farmers Club, Baldwin County Farmers Federation, and Baldwin County Cattlemen's Association, as well as other agricultural programs sponsored by NRCS and ACES. Past experience has shown that it is more effective to go to the farm organizations, rather than inviting them to attend Watershed Project programs. Watershed Project programs tend to attract audiences who are concerned about water quality. By attending other farm organizations' programs, plan sponsors will reach the target audience. Focus at these meetings should be on positive projects and acknowledgement of other sources of nonpoint source pollution in the Watershed.

Responsible Parties: Watershed Project Coordinator, NRCS, ACES
Cooperators: Baldwin County Farmers Federation, South Baldwin Farmers Club, Young Farmers Club

Potential Funding: No additional funding needed

Schedule: Second quarter 2001

Progress: Watershed Project has hosted a farmers' breakfast and the project coordinator attended conservation tillage workshops in 1999 and 2000 as well as a conservation tillage equipment demonstration field day in winter of 2000. Coordinator also attends and assists with meetings sponsored by the Alabama Cooperative Extension System, such as the Peanut and Cotton Growers meeting in winter of 2000.

- c. *Utilize Partners for Clean Water program to recognize agricultural producers with a good record of BMP implementation.*

Discussion: This BMP recognition program provides signs and other forms of recognition to landowners. New ways for increasing participation from farmers need to be explored.

Responsible Parties: Watershed Project CAC and Coordinator, SWCD

Cooperator: NRCS

Potential Funding: Baldwin County SWCD

Schedule: On-going

Progress: Several *Partners for Clean Water* awards have been given for practices such as livestock exclusion from streams, stream crossings, and converting highly erodible land into pasture or trees. The project coordinator will continue to work with partner agencies to recognize future candidates.

- d. *Work with Alabama Department of Agriculture and Industries (ADAI) and County Solid Waste Management staff and other interested parties to improve opportunities for hazardous waste disposal for agricultural producers.*

Discussion: Work with responsible agencies to establish an annual amnesty day event. Although initial costs will be high due to citizens bringing chemical products stored over several years, if held annually costs should decrease in subsequent years.

Responsible Parties: ADAI, Baldwin County Solid Waste Management Department

Cooperators: SWCD, Watershed Project CAC, Baldwin County Environmental Advisory Board (BCEAB), Alabama Coastal Foundation (ACF), ACES

Potential Funding: County funds, ADAI, foundations/private organizations (Monsanto, ACF), EPA, Mobile Bay National Estuary Program (NEP), Gulf of Mexico Program, Alabama Coastal Impact Assistance Program (CIAP)

Schedule: Second quarter 2002

Progress: As part of the CIAP, funds have been approved for agricultural hazardous waste collection events in 2002 and 2003. The events are not permanent disposal operations. Project coordinator has expressed interest in partnering on this project with all the above cooperators. Grants to fund this project are being sought by the ACF.

2. Reduce NPS pollution resulting from construction and land clearing activities.

Strategy:

- a. *Promote the new Homebuilders Association of Alabama's (HBAA) Stormwater Certification Program as well as offer NPS and BMP workshops/ educational programs for construction industry.*

Discussion: Encourage implementation of NPS control measures during construction through promoting the HBAA Qualified Stormwater Certification Program and offering educational and outreach programs for local governments and builder/contractor groups. Provide mini-workshops on material addressed during April 1997 Erosion and Sediment Control Conference in evening or weekend formats. Distribute "Controlling Erosion and Sediment in Homebuilding Activities" handbook developed by HBAA. Utilize the Nonpoint Source Education for Municipal Officials (NEMO) to educate and train local city and county official about NPS and stormwater pollution prevention and treatment.

Responsible Parties: Baldwin County Homebuilders Association, ADEM, Watershed Project Coordinator

Cooperators: BCEAB, Baldwin County Planning Department, Mobile Bay NEP, HBAA

Potential Funding: EPA

Schedule: ongoing

Progress: Two one-day workshops focused on coastal construction best management practices have been organized by the Watershed Project in partnership with ADEM, Troy State University, Baldwin County SWCD, and others. NEMO training continues as needed with a program held in July, 2001.

- b. *Utilize Partners for Clean Water program to provide recognition to developers and contractors who have a good record of BMP implementation..*

Discussion: This BMP recognition program provides Partner for Clean Water signs and other forms of recognition to developers and contractors. New ways for increasing participation from developers and contractors need to be explored.

Responsible Parties: Watershed Project CAC and Coordinator, SWCD

Cooperator: NRCS, Baldwin County Homebuilder's Association, Board of Realtors, BCEAB

Potential Funding: Start-up funding provided by Baldwin County SWCD

Schedule: On-going

Progress: One Construction Partner for Clean Water award has been awarded to the ACE Hardware Distribution Center in Loxley for properly installed and maintained stormwater BMPs. In August, 2001, the most recent Construction Partner for Clean Water award was given to the City of Foley for stormwater abatement construction and properly installed and maintained stormwater BMPs.

- c. *Develop county-wide NPS guidelines or guidelines for land use activities in priority areas according to the Baldwin County Subdivision Regulations, Planning and Zoning Ordinances and Flood Damage Prevention Plan*

Discussion: Support should be given for long range planning initiatives by the Baldwin County Planning Department, for example, the proposed Master Plan. Support should also be given to communities wishing to become a newly zoned area. The Weeks Bay Watershed Project will encourage coordination among county and municipal governments and ADEM to develop an enforceable countywide erosion control program. Additional staff may be required for inspection and enforcement activities.

Responsible Parties: BBC, Baldwin County Planning Department, Baldwin County Parks and Recreation Department

Cooperators: ADEM, BCEAB, Watershed Project CAC, and SWCD.

Potential Funding: BBC

Schedule: First quarter 2001

Progress: Baldwin County Planning and Zoning Department amended and revised its subdivision regulations and planning and zoning regulations in 1999. Erosion and sediment control and sensitive overlay districts (such as wetlands) were emphasized in these new documents. Work on a master plan for county land use, environmental considerations, and other issues began in 2000 and is currently underway.

- d. *Educate citizens on local, State and Federal regulations governing water quality, enforcement options and BMPs.*

Discussion: Training and literature can be developed to educate citizens on water quality regulations and Best Management Practices used during construction activities. Volunteers will learn the difference between a site that is being cleared with no potential violations and a site that has potential to negatively affect water

quality. If a problem is discovered, the Baldwin County Homebuilders Association office will be notified and assistance requested. If necessary, a regulatory authority will be contacted to address water quality violations.

Responsible Parties: Watershed Project Coordinator, AWW, Coastal Rivers Coalition (CRC), Mobile Bay NEP

Cooperators: ADEM, ACF

Potential Funding: Mobile Bay NEP

Schedule: Third quarter 2001

Progress: The Watershed Project in partnership with the CRC created Baldwin - Mobile Partners with Sediment. This group met to educate CRC members on how to recognize a problem (incorrect BMP placement, installation, and maintenance) and whom to call to report a problem. Future meetings should be held to refresh CRC members on old regulations and educate them on new ones.

- e. *Support countywide wetland protection provision in the Baldwin County Subdivision Regulations and work to continue protection of wetlands.*

Discussion: A county wetland protection program is part of the new Baldwin County Subdivision Regulations that should help in preventing wetland losses now permitted under the Section 404 Nationwide Permit program. Valuable wetlands have been identified through the Baldwin County Wetland Advanced Identification (ADID) program in the southern part of the county. A countywide wetland conservation plan is being created through the Baldwin County Planning Department, which will identify current wetlands and prioritize them for restoration and protection. This program may also allow for the development of mitigation performance standards and require accountability for mitigated wetlands that are not functioning properly.

Responsible Parties: BBC, Baldwin County Planning Department

Cooperators: COE, ADEM, ADCNR, State Lands Division, Coastal Section, BCEAB, Watershed Project CAC, ACF

Potential Funding: Baldwin County

Schedule: On-going

Progress: Baldwin County Planning Department has completed the ADID for the southern part of the county and has received another EPA grant to continue mapping wetlands in Baldwin County and promote restoration activities. CAC has sent a letter in support of development guidelines for wetland protection.

- f. *Monitor COE and ADEM public notices for bulkhead construction, wetland filling and dredging permits in the Watershed.*

Discussion: Review COE public notices for activities within the Watershed. Provide written comment during public comment period

on all permits where activities are questionable or may cause unnecessary environmental impacts.

Responsible Parties: Watershed Project CAC, BCEAB

Potential Funding: No additional funds necessary

Schedule: On-going

Progress: Project coordinator reviews all public notices and comments when appropriate.

3. Reduce nonpoint source pollution from residential sources.

Strategy:

- a. *Utilize "Baldwin County Greener by the Yard"(GBTY) program to provide free technical assistance to homeowners in landscape planning and plant selection, nutrient and chemical applications, shoreline protection and other residential NPS problems. Information and assistance will also be offered on preventing and controlling invasive exotic plant species.*

Discussion: The *Baldwin County Greener by the Yard* program is a cooperative program currently being piloted on a small-scale within the county. Partners to recruit for this initiative include realtors and landscaping companies. GBTY could become a part of the closing packet for new homeowners, landscape companies and nurseries, and could promote sale of native plants through use of GBTY. Funding should be pursued to implement the program on a larger scale, possibly statewide. Additional funds are needed to publish more handbooks for wider distribution, train Master Gardener volunteers, and provide yard signs to participants.

Responsible Parties: Baldwin County Master Gardeners, ACES

Cooperators: Watershed Project Coordinator, ADEM

Potential Funding: Legacy, Inc., ADEM, ACES, Mobile Bay NEP

Schedule: Third quarter 2002

Progress: Project coordinator has partnered with the Master Gardeners to offer "Town Hall" meetings in Marlow and Loxley. Greener by the Yard and the new Residential Partner for Clean Water program were presented. Yard signs have been created and are brought to events such as Earth Day and the annual Weeks Bay plant sale. Distribution of the handbook continues at events and workshops like River Cleanup. Coordinator partners with other groups to provide support and education to interested residents of Baldwin County both inside and outside of the Watershed.

- b. *Work with County Solid Waste Management staff to provide opportunities for residential hazardous waste disposal.*

Discussion: Work with responsible agencies to establish annual

Amnesty Day event. Any county resident would be provided the opportunity to dispose of chemical products, paints, etc.

Responsible Parties: Baldwin County Solid Waste Management

Cooperators: Watershed Project Coordinator, Baldwin County SWCD, BCEAB, ACF

Potential Funding: County funds, SWCD funds, foundations (Monsanto, ACF), EPA, Mobile Bay NEP, Gulf of Mexico Program

Schedule: Second quarter 2002

Progress: As part of the CIAP (2001), funds have been approved for residential hazardous waste collection events in 2002 and 2003. The events are not permanent disposal operations. Project coordinator has expressed interest in partnering on this project with all the above cooperators for a permanent disposal program. Grants to fund this project are being sought by the ACF.

4. Protect ground water resources through a reduction in nonpoint source pollution.

Strategy:

- a. *Identify major ground water withdrawal zones in Watershed.*

Discussion: Many municipalities are currently identifying these areas through the Wellhead and Source Water Protection Program. Other significant withdrawal zones within the county need identification.

Responsible Parties: GSA

Cooperators: ADCNR Office of Water Resources

Potential Funding: ADEM, Baldwin County, municipalities

Schedule: On-going

Progress: Sites where groundwater is used for municipal water supply are identified and information about the locations is available from municipal governments.

- b. *Initiate citizen's ground water monitoring program.*

Discussion: Work with AWW and Ground Water Guardians program to develop protocol for ground water testing.

Responsible Parties: AWW, Watershed Project Coordinator, ADEM

Cooperators: GSA, Ground Water Guardians, ACF

Potential Funding: ADEM, EPA

Schedule: Third quarter 2004

Progress: None

- c. *Initiate program to support adoption of Countywide licensing requirements for commercial well drillers.*

Discussion: Well-driller licensing is needed to protect ground water resources. All other counties in Alabama require licensing under Alabama law. Baldwin County needs to develop its own requirements or be included under Alabama guidelines.

Responsible Parties: BBC, ADEM, Watershed Project CAC, BCEAB

Cooperator: ADCNR Office of Water Resources

Potential Funding: No additional funding required

Schedule: On-going

Progress: Legislation was initiated to require licensing of well drillers in Baldwin County. The legislation was not passed.

d. *Educate citizens on ways to prevent ground water pollution.*

Discussion: Partner with the Baldwin County Master Environmental Educators and utilize materials available through Ground Water Guardian Program to incorporate a ground water component into other Watershed Project educational activities. Promote eye-catching materials such as cups, posters, etc.

Responsible Parties: Baldwin County Master Environmental Educators (ACES), Watershed Project Coordinator and CAC, Weeks Bay Reserve Education Coordinator

Cooperators: ACF

Potential Funding: EPA CWA §319

Schedule: Third quarter 2004

Progress: None

5. Reduce the pollution generated by water-related recreational activities, including sewage, petroleum products, and litter.

Strategy:

a. *Educate boaters on location of pump-out facilities in Watershed and environmental degradation caused by irresponsible recreational activities and littering of waterways.*

Discussion: Host annual event that may include kayak and canoe races, litter cleanup and other water-dependent activities to raise awareness of recreation effects in Watershed. Develop maps and other literature to make boaters and marine police aware of sensitive habitats in the Watershed. Promote safe and environmentally sound boating practices. Support establishment of "No Wake" zones.

Responsible Parties: Gulf Coast Resource, Conservation and Development (GCRCD), ADPH, ADEM

Cooperators: Watershed Project Coordinator, CAC

Potential Funding: Clean Vessel Act, GCRCD, ADCNR Coastal Section, State Lands Division, Gulf Coast Conservation Association

Schedule: Second quarter, 2001

Progress: The Weeks Bay NERR built in 2000 and is operating a pump-out station at the Marina on Weeks Bay. In the summer of 2001, Weeks Bay NERR partnered with Faulkner State Community College to produce a locator map of pump-out stations in Coastal Alabama. Educational information on the value of pump-out stations and their use is included on the map. Successful river cleanups have been held each spring since 1997.

- b. *Host coastal boat and marina owners workshop.*

Discussion: Host workshop for boat and marina owners in coastal Alabama on pollution prevention strategies.

Responsible Parties: WBNERR, GCRCD

Cooperators: ADEM, ADCNR Coastal Section, State Lands Division, Mobile Bay NEP, ACF

Potential Funding: GCRCD, ADEM

Schedule: Third quarter, 2001

Progress: In partnership with Auburn University Marine Extension and Research Center, two workshops on BMPs for marina owners and operators will be held by Fall, 2001.

6. Continue Weeks Bay Water Watch monitoring and formally analyze data to identify trends and design recovery plans if necessary.

Strategy:

- a. *Formal analysis of Weeks Bay Water Watch monitoring data should be done to evaluate trends over at least five years of data collection. These data could be used to establish Total Maximum Daily Loads (TMDL) and design a plan of recovery.*

Discussion: Analyze water quality data to identify stream reaches that do not meet water quality standards in the Watershed. Use the analysis to show trends over time and potential use for TMDL implementation on streams on the 303(d) list.

Responsible Parties: Weeks Bay Water Watch, ADEM Water Quality Section, and the Watershed Project Coordinator

Cooperators: Weeks Bay TAC; ADEM Mobile Field Operations; ADEM Coastal Section, State Lands Division; Mobile NEP and the Mobile Clean Water Partnership.

Potential Funding: AWWA, CAC, ADEM, Clean Water Action Plan

Schedule: Third Quarter, FY2001

Progress: The accumulation of data continues and is currently available in spreadsheet format. *Weeks Bay*, the first installment of the "Coastal Series" of AWW Booklets was published in April, 2001.

The booklet summarizes water quality data in a clear and informative manner. The information in the booklet will be presented by the coordinator to local government and other groups.

b. *List of possible "Strategies for Restoration of 303(d) Listed Streams" in the Weeks Bay Watershed.*

Discussion: The following strategies could be considered in the implementation of restoration of severely impaired and partially impaired stream segments as designated by the current 303(d) listed streams for the Watershed.

1. Research the data used to designate stream segments and evaluate the conditions under which they were monitored and summarize the findings.
2. Verify sources of identified pollutants by doing a streamwalk.
3. Evaluate data comments and violations for each stream segment.
4. Pursue monitoring resources as designed by the TAC and ADEM staff.
5. Add additional water watch sites on those 303(d)-listed stream segments.
6. Pursue fecal coliform vs *E. coli* sampling for pathogen impacted streams.
7. Expand turbidity testing to include listed stream segments as well as their upstream tributaries.
8. Review volunteer monitoring methods quarterly to assure QA/QC compliance on the listed stream segments.
9. Review new discharge requests to the Weeks Bay Watershed streams and provide accurate scientific comments about the permit.
10. Review storm water permits and new construction permits to assure adequate protection to the listed streams segments.

Responsible Parties: Weeks Bay Water Watch, ADEM Water Quality Section, and the Watershed Project Coordinator

Cooperators: Weeks Bay TAC; ADEM Mobile Field Operations; ADEM Coastal Section, State Lands Division; Mobile NEP and the Mobile Clean Water Partnership.

Potential Funding: ADEM, Clean Water Action Plan

Schedule: Third Quarter, 2001

See Appendix II for evaluations of specific segments on the current list and a "Fact Sheet" on Section 303(d) List.

Progress: Weeks Bay Water Watch training workshops are held periodically to certify additional volunteer monitors and to expand the number of sampling sites. Volunteer monitors are recertified annually by the Weeks Bay Water Watch Quality Assurance officer to

ensure data quality. Water Watch quality assurance officers and trainers are required to attend refresher courses every two years. Sampling of fecal coliform bacteria by volunteers is coordinated with ADEM as part of 303(d) stream survey in the Watershed. Monitoring data are reviewed by the Watershed Project office for each sampling event. Review of methods for new water quality parameters such as total suspended solids (TSS)/total organic solids (TOS), nitrogen and phosphorus is in the preliminary stage. A pilot program for TSS/TOS is presently underway at four sites within the Watershed. The CAC communicated its concern to the county regarding dirt pit permitting and effects on water quality on 303(d) streams. The Watershed Coordinator and the CAC have reviewed data from testing of 303(d) listed Watershed streams generated by Weeks Bay Water Watch and by independent fecal coliform studies carried out by the Watershed Coordinator. A report will be prepared and submitted to ADEM in Fall, 2001 recommending a TMDL be carried out on at least one of the streams as soon as possible.

B. **HABITAT PROTECTION AND RESTORATION**

1. **Ensure protection of fish and wildlife habitat, including submerged grassbeds, fringe marsh, shorelines, and other wetlands and upland forest through land acquisition, educational, and incentive programs.**

Strategy:

- a. *Provide educational programs for the general public and K-12 on economic, social and environmental benefits of wetlands.*

Discussion: Develop workshops and tours and distribute literature that addresses the importance of wetland protection and the effects of wetland loss in Baldwin County. Written materials will be provided to the print media for publication. Public service announcements will be written and submitted to radio and television stations. K-12 will be targeted in partnership with the Master Environmental Educators.

Responsible Parties: Watershed Project Coordinator and CAC
Cooperators: FWS, ADID, Mobile Bay NEP, ADCNR Coastal Section, State Lands Division, ACF

Potential Funding: Existing resources can be utilized to cover workshop costs. A nominal fee may be charged to workshop participants to cover program costs.

Schedule: on-going

Progress: Two workshops targeting real estate professionals, developers, citizens, and local government officials have been held on the benefits and functions of wetlands.

- b. *Utilize existing programs to provide cost-share to landowners for habitat restoration activities such as EQIP, Wetlands Reserve Program, CRP, WHIP, National Coastal Wetland Conservation Grants Program, and Partners for Wildlife. Pursue funding to establish new cost-share opportunities for habitat protection and restoration activities.*

Discussion: Assist NRCS and FWS in informing landowners of the availability of federal cost-share assistance for habitat protection. Many programs are available to assist landowners in habitat restoration and protection activities, however, many landowners are not aware that programs are available or do not rank habitat protection as a management priority. Develop educational programs that include literature, workshops, and press releases on conservation options. Write grants to fund additional programs that will provide cost-share at a higher rate, increasing the incentive for landowners.

Responsible Parties: Watershed Project Coordinator, CAC, Baldwin County SWCD, NRCS, FWS

Potential Funding: EPA, Gulf of Mexico Program

Schedule: On-going

Progress: Working in partnership with the NRCS and FWS, the Watershed Project has promoted several cost-share projects located in the area. These include stream crossings, livestock exclusion devices, and other agricultural BMPs.

- c. *Provide information to the general public on tax incentives and other benefits that can be achieved through the use of conservation easements for the protection of private lands and identify and establish an appropriate organization to manage conservation easements in the Watershed.*

Discussion: Hold workshops for the general public on conservation easements and other land protection strategies. Assistance may come from Land Trust Alliance, Alabama Forest Resources Center, and Coastal Land Trust. Determine the organization responsible for managing conservation easements in the Watershed or establish a new land trust organization. Develop goals for an easement program and criteria for accepting easements. Develop easement monitoring and violation policies.

Responsible Parties: WBNERR, Weeks Bay Reserve Foundation (WBRF), Watershed Project CAC

Cooperators: Coastal Land Trust, FWS, Trust for Public Land, Land Trust Alliance, Forever Wild, SWCD, Alabama Forest Resources Center.

Potential Funding: WBRF, Baldwin County ACES

Schedule: Second Quarter, 2000

Progress: Workshop on Conservation Easement Basics was held in May 2000 with over 90 participants including local attorneys, realtors, landowners, and interested citizens. Follow up workshops are planned. Currently, efforts are underway to produce literature, a workshop and funds for conservation easement projects.

- d. *Develop criteria for prioritizing land for acquisition in the Watershed. Identify subwatersheds with significant habitat restoration needs and rank valuable parcels for acquisition or other forms of protection.*

Discussion: Develop ecological indicators that can be used to identify valuable habitats in the Watershed. Examine aerial photographs to identify subwatersheds with significant habitat loss. Identify possible areas for restoration based on their potential benefit for fish and wildlife and/or to mitigate water quality effects from adjacent land use activities. Prioritize areas for habitat restoration and important parcels for protection. Develop report and map to justify ranking and distribute to land protection organizations.

Responsible Parties: The Nature Conservancy, Watershed Project Coordinator

Cooperators: FWS, ADEM, WBNERR, WBRF

Potential Funding: EPA 319 Program

Schedule: On-going

Progress: The Alabama Natural Heritage Program completed a comprehensive Watershed Conservation Plan in June 2000. This document and related GIS maps outline priority acquisition areas, natural features in need of protection, and general comments on a conservation strategy. A study by WBNERR of general land use activity is in progress.

- e. *Develop a land protection and acquisition plan that will leverage limited funds to ensure that priority parcels can be purchased when available.*

Discussion: Develop a coordinated approach to land acquisition and protection by bringing together the key players listed below and the preservation and restoration needs identified in sections c and d. In the past, land acquisition has been only minimally coordinated among land protection organizations and has been driven largely by funding opportunities. Bring participants together to develop a straw plan for land acquisition in the Watershed and develop a streamlined approach that can be used in acquiring properties under strict time constraints.

Responsible Parties: WBNERR, Weeks Bay Watershed Project Coordinator

Cooperators: Nature Conservancy, Forever Wild, WBRF

Potential Funding: EPA CWA 319 Program, Forever Wild, Nature Conservancy, private donations

Schedule: Third quarter, 2001

Progress: Grants have been secured for land acquisition and conservation easements with land acquisition tentatively scheduled for Fall, 2001. In addition, potential funding from FWS and NOAA have been identified for use in acquisition efforts in Weeks Bay area.

- f. *Establish no-wake zones in areas where sensitive shoreline habitats are affected by erosion.*

Discussion: Determine the level of support of local citizens for increased no-wake zones. A secondary benefit of this strategy is increased public safety, which appears to be a common concern of river users. Areas with significant shoreline erosion due to boating activities should be identified and protected. Increasing the size and/or number of no-wake zones will provide increased opportunities for canoeing, kayaking, and fishing. Additionally, low wave energy forms of boating should be promoted.

Responsible Parties: ADCNR

Cooperators: Watershed Project CAC and Coordinator, Bass Masters, and other fishing associations

Potential Funding: No additional funds are needed

Schedule: First quarter, 2002

Progress: From CR 32 north, a no-wake zone has been established due in part to the requests of private property owners.

- g. *Encourage legislation statewide for overlay districts of riparian buffer zones for planning and zoning documents, countywide master plans, and subdivision regulations.*

Discussion: Riparian buffers are a first line of defense in filtering out pollutants carried by stormwater into waterways. By encouraging enabling legislation, sensitive areas may incorporate zones of nondisturbance into local regulations. Research from the Center for Watershed Protection should be relied upon for scientific basis.

Responsible Parties: Watershed Project CAC, Watershed Project Coordinator, Weeks Bay Protective Association

Cooperators: Baldwin County Planning and Zoning Department, Baldwin County Homebuilders Association

Potential Funding: No additional funding necessary

Schedule: First quarter, 2002

Progress: None

- h. *Create Watershed Project educational programs for presentation to different groups throughout the Watershed.*

Discussion: Create Power Point programs suitable for general audiences. Topics may include wetlands, conservation easements, nonpoint source pollution, and available cost-share programs (EQIP, WHIP, CRP, etc.). Watershed management and water quality programs should be packaged in a manner that are easy for Watershed Project CAC members, WBNERR volunteers, and WBNERR employees to use.

Responsible Parties: Watershed Project CAC, Watershed Project Coordinator

Cooperators: WBNERR, ADEM, Nonpoint Education for Municipal Officials (NEMO), Troy State University

Potential Funding: if necessary - Legacy, Inc., Mobile Bay NEP

Schedule: Fourth quarter, 2001

Progress: The AWW *Citizen Volunteer Water Quality Monitoring on Alabama's Coast: Weeks Bay* was printed in April, 2001. Distribution of the document is planned the last half of 2001. The intended audience of citizens and local government will receive an overview of the Water Watch program and the data collected in the Watershed. Watershed project presentations have been given at several localities in the Watershed providing an overview of the project's mission and goals.

C. INFRASTRUCTURE AND GROWTH MANAGEMENT

1. Reduce pollution from existing and future on-site sewage systems.

Strategy:

- a. *Identify areas with significant effects from on-site sewage disposal systems OSDS (failures, illegal disposal, pollution) and public-private owned treatment works (POTW) (failures, overflows, pollution); encourage solutions through education and incentives.*

Discussion: Use water quality monitoring data to identify areas impacted by sewage problems; indicate if sewage pollution may be caused by septic tank systems, POTW, or both. Conduct education and outreach programs to inform residents. Promote use of alternative on-site sewage treatment systems. Promote proper operation and maintenance by owners of all OSDS through education and incentives. Seek support from commercial OSDS maintenance companies to provide discounted pump-outs to economically disadvantaged homeowners and free inspections to identify septic tank system failures. Seek funding assistance for low-income areas to provide or repair septic tank systems. Encourage OSDS maintenance companies to become certified maintainers of OSDS. Produce and maintain a list of certified OSDS maintenance companies and installers. Work with engineers, County Health Department, and Alabama Health Department to speed up approval process for alternative systems.

Responsible Parties: BBC, Baldwin County Health Department, POTW, Coastal Zone Management Committee, Watershed Project Coordinator, Baldwin County Water and Sewer Authority, BCEAB
Cooperators: ACES, ADPH, ADEM, Alabama Onsite Wastewater Association, University of South Alabama

Potential Funding: EPA Rural Hardship Assistance Program, 319 Program, Gulf of Mexico Program

Schedule: On-going

Progress: The Weeks Bay Watershed Project participated as a partner in the 1999 Mobile Bay NEP septic tank survey of Magnolia Springs, funded by the Gulf of Mexico Program Shellfish Recovery Grant. This successful survey proved useful for information gathering as well as an educational tool. A grant was submitted in 2000 to the Gulf of Mexico Program by the ADPH to retrofit septic tanks with effluent filters. The suggested target community is Marlow.

- b. *Educate installers, homeowners and businesses on proper septic tank placement, installation, operation, and maintenance; about use of septic tank effluent filters; and about advantages of alternative on-site sewage treatment technologies.*

Discussion: Develop materials to be used for workshops, public service announcements and other media. Conduct on-site sewage education workshops in Baldwin County and the Watershed for the public, local officials, developers, realtors, lenders, etc., and school children.

Responsible Parties: ADPH, Baldwin County Health Department, Weeks Bay Watershed Project Coordinator.

Cooperators: ACES, ADEM, Alabama Septic Tank Association, University of South Alabama, BBC

Potential Funding: EPA 319 Program; Legacy, Inc.; Gulf of Mexico Program

Schedule: On-going

Progress: A technical workshop was held in Fall 1999 on alternative on-site septic disposal systems. A similar workshop was held in Fall 2000 targeting professional installers who need continuing education credits for the newly required installers license. A brochure on OSDS has been printed and distributed. Additional workshops are planned.

- c. *Encourage the adoption of county/ local ordinances regarding OSDS. Ordinances should contain effective requirements for OSDS approval, homeowner maintenance and repair and effluent quality before infiltration to soil. Encourage communities to use small, decentralized on-site sewage treatment and disposal systems with adequate operation and maintenance performed by certified personnel.*

Discussion: Stronger local ordinances will be necessary to prevent enteric bacteria from entering ground or surface waters from septic tank systems and POTW. Requirements and incentives for inspections, certifications, and necessary upgrades of OSDS before the sale or transfer of property (in the county or in specific areas) should be considered. Larger minimum lot sizes are one goal of a State committee on on-site septic treatment as well as other related water quality topics. Support should be given to regulations that manage OSDS establishment with respect to soil type and suitability for sewage treatment. Effluent quality criteria and annual monitoring of systems should be required.

Responsible Parties: BBC, Baldwin County Planning Department

Cooperators: BCEAB, Baldwin County Planning Department, SWCD, Weeks Bay Watershed Project Coordinator and CAC, ADPH, Baldwin County Health Department, ADEM, Alabama Septic Tank Association, civil engineers, University of South Alabama, Coastal Zone Management Committee, local RC&D.

Potential Funding: Baldwin County; SWCD; renewable permit fee; portion of fee paid to Baldwin County Health Department with Application For Approval of An Onsite Sewage Disposal System; OSDS maintenance/installer license fee; or other.

Schedule: First quarter, 2002

Progress: For lots that require septic systems, the amended Baldwin County Subdivision regulations now require a minimum lot size of 20,000 square feet with public water supply and 40,000 square feet without public water supply management. This exceeds current ADPH requirements. Current ADPH regulations are under review.

2. Promote planning and zoning that will protect environmentally sensitive areas.

Strategy:

- a. *Identify areas that contain sensitive or rare habitats and sites that, due to soil characteristics, are unsuitable for certain types of development. Continue to track land use changes in the Watershed. Support the environmental protection measures incorporated into the Baldwin County Planning and Zoning Master Plan and make recommendations.*

Discussion: Identify habitats at risk and make maps available to planners, permitting authorities, and the general public. Although development activities may not be prevented, assistance may be provided to minimize impacts to sensitive areas.

Responsible Parties: ADID, Watershed Project Coordinator, FWS, The Nature Conservancy, Gulf Ecological Management Sites Program

Cooperators: SARPC, NRCS, BCEAB, ACF

Potential Funding: Costs should be low, except for reproduction of maps and reports. Existing programs may support these activities.

Schedule: On-going

Progress: The Alabama Natural Heritage Program of The Nature Conservancy completed a Weeks Bay Watershed Conservation Plan in Spring, 2000. This plan identified ecologically significant areas within the Watershed that should be protected and/or acquired. Land use changes in the Watershed were investigated by a WBNERR graduate fellow from Mississippi State University with findings presented to the CAC in July, 2001.

- b. *Educate Watershed residents on the importance of limiting the amount of impervious ground cover to less than 10 percent of total land area in each subwatershed through the introduction of better site design and wise growth management.*

Discussion: Results of recent research have demonstrated that once impervious cover exceeds 10 percent, the following changes can be expected: increased flood peaks, lower dry weather flow, increase in pollutant loads, decline in fish diversity, and decline in wetland plant and animal diversity. Development limits can be accomplished through zoning ordinances or through land acquisition or preservation programs. Subwatershed areas approaching build-out

will be identified. Easement programs and land acquisition will be targeted to critical areas.

Responsible Parties: BBC, Baldwin County Planning Department, Watershed Coordinator, WBNERR GIS Coordinator, WBNERR Research Coordinator

Cooperators: Watershed Project CAC, BCEAB, SWCD, SARPC

Potential Funding: Baldwin County, SWCD, NOAA Graduate Research Fellows

Schedule: Third quarter, 2001

Progress: Recent Graduate Research Fellows at the WBNERR are focusing on land use/land cover and its effect on water quality. Their results should be shared throughout the Watershed. A NEMO presentation was given to Baldwin county legislators, commissioners and local mayors in July, 2001.

- c. *Educate residents on the need for planning and zoning and the importance of retaining natural areas. Implement planning tools that are supported by Watershed citizens to manage growth and land use changes in the Watershed. target groups should include local grassroots organizations.*

Discussion: Discuss with local citizens land use planning tools that can be applied to manage growth during public meetings, workshops, newsletter and other forums. Use the Alabama NEMO as a training tool for citizens, developers, planners, and elected officials, especially newly elected county commissioners. Direct development to appropriate areas, encourage cluster development in suitable areas and prohibit construction activities in environmentally sensitive areas. Limit residential density on sites where soils are marginal or unsuitable for on-site sewage treatment. Establish minimum widths for vegetation along specified tributaries.

Responsible parties: ADCNR Coastal Section, State Lands Division, Watershed Project CAC, Baldwin County Planning Office, Watershed Project Coordinator, BCEAB, ACF, ADEM

Potential Funding: Legacy, ADCNR Coastal Section, State Lands Division

Cooperators: SARPC, Local citizens

Potential Funding: No additional funding necessary

Schedule: Second quarter, 2001

Progress: ADEM Office of Education and Outreach (OEO) has created the Alabama NEMO program for statewide use. The revised Baldwin County Planning and Zoning regulations allow use of Planned Unit Development (cluster developments). Many groups in the Watershed are seeking support for zoning.

- d. *Facilitate opportunities for education and training on sedimentation and erosion control for public works employees as well as those involved in private road building activities.*

Discussion: Partner with ADEM OEO to hold public workshops as well as private training seminars to target groups. Encourage public works departments and developers to hire trained contractors.

Responsible Parties: ADEM, County and municipal public works departments

Cooperators: BCEAB, Mobile Bay NEP

Potential Funding: EPA 319

Schedule: Third quarter 2002

Progress: Erosion and Sediment Control Conferences were held in April 1997 and June 1999. In July, 2001, NEMO program was presented to Baldwin County Commissioners, municipal mayors and legislative delegation. Sediment and erosion control educational activities will be continued.

3. Identify unpaved roads that contribute sediment to the Watershed and work with the county to develop a plan to improve these roads within a reasonable time frame.

Strategy:

- a. *Identify and rank dirt roads in the Watershed that contribute most to stream sedimentation.*

Discussion: Utilize county maintenance data and water quality data to identify problem areas. Utilize environmental and economic data to prioritize roads for improvement. Seek funds to assist the county in limestone material costs for priority dirt roads.

Responsible Parties: Watershed Project Coordinator and CAC, SWCD, Baldwin County Environmental Advisory Board

Cooperators: Baldwin County Engineering Department, Baldwin County Planning Department

Potential Funding: No additional funding needed

Schedule: On-going

Progress: The Baldwin County EAB ranked roads throughout Baldwin County on their potential for water quality degradation. This report listed Langford Road and Beasley Road as roads of top concern. The Baldwin County Highway Department has since paved both of these roads as well as Sherwood-Highland Road in the Weeks Bay Watershed. Erosion and Sediment Control Conference was held in April 1997 and June 1999. CIAP provides funds for road resurfacing projects within Baldwin County for fiscal years 2001-2004. Coordinator will provide a list of project sites for future resurfacing. Baldwin County has identified funds for road resurfacing to be spent by April, 2002. Coordinator has contacted County Administrator for clarification of projects and for input on possible projects. Continue sediment and erosion control educational activities.

- b. *Contribute and monitor the BCEAB's ranking of road improvement projects, which is based on environmental as well as economic needs.*

Discussion: Currently road improvement projects are ranked by the number of complaints, road improvement costs, and funding availability. The Baldwin County EAB has produced a document that ranks roads based on standard criteria that include environmental effects. Environmental effects should be factored into the ranking process along with economic and social concerns, to develop a method that is fair and consistent.

Responsible Parties: Baldwin County EAB and County Commission

Cooperators: Watershed Project CAC and Coordinator, BCEAB, Baldwin County ACES, County Engineering Department

Potential Funding: No additional funding needed

Schedule: On-going

Progress: Coordinator will continue to attend BCEAB meetings to provide input on issues impacting the Watershed and Baldwin County.

4. Reduce water pollution from urban stormwater discharges including residential subdivisions and commercial areas.

Strategy:

- a. *Monitor the regulatory requirements for water storage in stormwater ponds in the subdivision regulations and require that ponds not be sited in environmental sensitive areas.*

Discussion: This provision needs to be incorporated into Baldwin County Subdivision Regulations.

Responsible Parties: BBC, Baldwin County Planning Department

Cooperators: BCEAB, Watershed Project CAC and Coordinator

Potential Funding: No additional funds needed

Schedule: On-going

Progress: The Baldwin County Planning and Zoning Department amended the subdivisions regulations in 1998. Stormwater pond capacity was increased in these new regulations.

- b. *Promote the use of storm drain stencils or additional signage in residential and urban areas of the Watershed.*

Discussion: Storm drain stencils are Mylar, plastic or cardboard cut outs of phrases such as "Dump no waste-drains to river, bay or streams." These phrases are spray painted on the concrete storm drains found in many residential and commercial areas. Stenciling may also be used on bridges in rural areas. A "Do not dump" sign

could also be added to the Alabama PALS Adopt-A-Stream signs that are already in place. Storm drain stenciling is a great project for young children. Inform teachers, Scout leaders, and other civic and environmental organizations of the availability of stencils. The use of stencils can also be promoted through newspaper articles and other forms of recognition.

Responsible Parties: Weeks Bay Reserve Education Coordinator, Watershed Project Coordinator, Auburn University Marine Extension and Research Center

Cooperators: Baldwin County Highway Department

Potential Funding: No additional funding needed

Schedule: Fourth quarter, 2002

Progress: Storm drain stencils are in place in parts of the Watershed. Use is continuously supported.

D. MANAGEMENT PLAN IMPLEMENTATION AND EVALUATION

1. Establish and maintain a system of priorities for academic research in addition to volunteer monitoring that will:

- a) contribute to the understanding of watershed conditions and processes, such as land use changes, habitat loss, and peak and minimal flows**
- b) assist in the establishment of trends in physical, chemical, and biological water quality parameters for surface and ground water; and**
- c) assist in decision-making activities of regulatory and management personnel by the transfer of technical and scientific information.**

Strategy:

- a. *Identify and rank information needs.*

Discussion: The CAC, TAC and the coordinator should identify information needs and develop a proposed research plan for the Watershed. The research should provide the information needed to accomplish the strategies documented in this management plan. The Research Plan should be distributed to research institutions affiliated with the Watershed Project should be incorporated into the WBNERR research plan.

Responsible Parties: CAC, TAC, Coordinator

Potential Funding: No additional funds needed

Schedule: Third quarter 1998

Progress: None

- b. *Support Weeks Bay Water Watch monitoring.*

Discussion: Maintain current monitoring activity with bi-weekly monitoring of active sites in the Watershed. Continue monitoring six basic Alabama Water Watch parameters and supporting those volunteers who wish to expand monitoring to include *E. coli* and nutrients. Hold basic and bacteriological certification workshops at least twice per year. Hold annual recertification sessions with cooperation of the AWW QA officer for each volunteer monitor as required by AWW protocols. Hold at least one annual Advanced Workshop for biological (bacteria and macroinvertebrate) monitoring.

Responsible Parties: Weeks Bay Watershed Coordinator, Weeks Bay National Estuarine Research Reserve

Cooperators: Alabama Water Watch, Mobile Bay NEP

Potential Funding: Baldwin County SWCD, CAC, Weeks Bay Volunteers and Weeks Bay Foundation. CIAP provides funding opportunities for purchase of water quality monitoring instruments and reagents.

Schedule: On-going

Progress: The Watershed Project continues to coordinate the Water Watch activity in the Watershed. In 1999 and 2000, the Weeks Bay Water Watch chapter was the most prolific data producing chapter in the AWW program. Each year the Weeks Bay Water Watch chapter has been given awards for monitoring activities and education and outreach. Training sessions continue including the latest session that occurred in June, 2001.

- c. *Maintain water quality database and library holdings of all watershed research reprints and reports.*

Discussion: Water quality data should be published bi-annually. Copies of water quality and research reports will be housed in Reserve's research library.

Responsible Parties: Watershed Coordinator, WBNERR Research Coordinator

Potential Funding: No additional funding needed

Schedule: First quarter 1998

Progress: All AWW water quality data are maintained in spreadsheet form. Research reports and reprints of pertinent articles are maintained in the coordinator's office. Weeks Bay WW data were published in the first issue of the AWW "Coastal Series" booklets.

- d. *Maintain and expand Watershed GIS program.*

Discussion: Maintain current coverage of Watershed, including land use, soils, hydrology, roads, sensitive habitats, monitoring sites and data. Network with other agencies and organizations with GIS programs to develop a data sharing protocol.

Responsible Parties: Watershed Project Coordinator, Bishop State Community College's Project EPIC (Environmental Protection Information Center)

Cooperators: SARPC, Mobile Bay NEP, FWS, ADID and Baldwin County.

Potential Funding: No additional funding needed

Schedule: Third quarter 1997

Progress: GIS data are collected as it becomes available and purchased as necessary. SAGDUG data are available from more than 30 local, State and Federal groups that have combined GIS data sources about south Alabama. The Watershed Project will have access upon request to the GIS data through WBNERR. An on-site technician continues to build GIS data supporting Watershed Project

needs. The coordinator will be trained in *ArcView* GIS software in order to stay current with technological advance of GIS programs.

2. Develop long-term support and involvement of Watershed residents through the leadership of CAC and Watershed Project Coordinator on watershed planning and management activities.

Strategy:

- a. *Provide special topic workshops and community events to keep citizens involved.*

Discussion: Expand River Cleanup to become a Watershed festival. Canoe race, recognition of special pollution prevention efforts, kids' environmental contests, exhibits, and entertainment can be held afternoon of morning cleanup. Take traveling exhibit to other festivals and fairs in the County. Schedule speaking engagements to civic and community organizations. Participate in Coastal Cleanup and Coast Week activities.

Responsible Parties: Watershed Project CAC, Watershed Project Coordinator

Cooperators: ADCNR Coastal Section, State Lands Division

Potential Funding: Private business/industry to sponsor event

Schedule: On-going

Progress: Increased efforts for advertising events like the River Cleanup are planned. In May 2001, prizes donated by local business and individual sponsors were given to participants in various categories. A kayak was raffled to all registered participants. The practice of raffling at least one large prize donated by a sponsor(s) will be continued. Informal exhibits at which BMP and pollution control literature was provided were set up at both the 2001 River Cleanup and Pond Day at a local business.

- b. *Actively solicit public input in all components of management plan.*

Discussion: Continue to hold public forums in Watershed communities and neighborhoods. Circulate draft Watershed Management Plan and final Management Plan to interested citizens, provide ample comment period and public hearings to solicit input. Provide annual review of progress on management plan Implementation, and update management plan at least every five years.

Responsible Parties: Watershed Project CAC

Potential Funding: No additional funding needed

Schedule: Fourth quarter 2001

Progress: The revised management plan dated June 2001 is scheduled for final release on or about October 2001. An event of as yet undetermined nature is planned to celebrate the release of the revised

plan. The plan will be provided to local groups and individuals at that time.

c. *Publish semi-annual Watershed Project newsletter.*

Discussion: Current funding may not be adequate to continue publishing a semi-annual newsletter. Seek additional funds to continue semi-annual newsletter.

Responsible Parties: Watershed Project Coordinator, Watershed Project CAC

Potential Funding: Baldwin County ACES

Schedule: On-going

Progress: Issues were published and new issues will continue to be published on a semi-annual basis. The Coordinator will assess the current funding and seek new sources of money.

d. *Establish a Weeks Bay Watershed association to build a coalition of voters who support management plan recommendations.*

Discussion: This organization, led by the Watershed Project CAC, will provide local support to the implementation of management plan recommendations. This organization will provide a fund raising base, a volunteer pool, and political influence.

Responsible Parties: Watershed Project CAC

Potential Funding: Watershed Citizens

Schedule: Second Quarter, 1998.

Progress: The Weeks Bay Watershed Protective Association was established in 1998.

3. Cooperate and partner with other Federal, State, and local agencies to achieve the objectives and strategies described herein.

Strategy:

a. *Submit an annual work plan to project advisory committees.*

Discussion: Work plan will include the strategies and schedules recommended in the management plan. Specific objectives will be addressed in the annual work plan. A draft work plan will be submitted to advisory committees in November of each year for review. Final annual work plan will be submitted in January of each year.

Responsible Parties: Watershed Project Coordinator, Planning and Technical Advisory Subcommittee, Steering Committee, and CAC

Schedule: Ongoing

Progress: Work plans have been submitted to ADEM and will continue to be submitted to advisory committees by the coordinator.

- b. *Encourage all agencies involved to sign memorandum of understanding supporting management strategies.*

Discussion: Following public comment period, develop Memorandum of Understanding to seek continued agency support of objectives and strategies identified in the Watershed Management Plan. Have public signing ceremony, possibly at the Weeks Bay Watershed Annual Public Meeting or River Cleanup Celebration.

Responsible Parties: Watershed Project Coordinator

Potential Funding: No additional funding needed

Schedule: Second quarter, 1998

Progress: None

- c. *Annual updates on management plan implementation to project advisory committees and local government officials.*

Discussion: Hold an annual Watershed Project meeting which would provide updates to the project cooperators and the general public on progress from monitoring and management initiatives.

Responsible Parties: Watershed Project Coordinator and advisory committees

Potential Funding: No additional funding needed

Schedule: Fourth quarter, 1998

Progress: No annual meetings have been held to date. Periodic updates and progress reports will be given by the coordinator at the monthly CAC meetings held the first Tuesday of each month. Addenda to the management plan will be prepared by the coordinator, reviewed by the CAC and published as necessary.

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LITERATURE CITED

- Alabama Agricultural Statistics Service. 1995. Alabama Agricultural Statistics. Bulletin 38. U.S.D.A. National Agricultural Statistics Service, Montgomery, Alabama.
- Baldwin, J.L. 1973. Climates of the United States. Environmental Data Services, NOAA, Department of Commerce, Washington, D.C. 133 p.
- Basnyat, P., Teeter, L., Flynn, K. and B. G. Lockaby. 1996. Relationships between landscape characteristics and non-point source pollution inputs to coastal estuaries. Rep. to U.S.D.C. NOAA. OCRM Award #NA47OR1097.
- Boone, P.A., 1972. Descriptive geology of southwest Alabama and the adjacent continental shelf: Alabama Geological Survey open-file report. 57 p.
- Carlston, C.W., 1950. Pleistocene history of coastal Alabama: Geol. Soc. America Bull., v. 10, p. 1110-1130.
- Cartwright, J., Presentation: Land Use Changes in the Weeks Bay Watershed, 1990 to 2000, Weeks Bay Watershed Project Citizen Advisory Committee Meeting, July 11, 2001.
- Chermock, R.L. 1974. The Environment of Offshore and Estuarine Alabama. Geol. Survey of Alabama. Geol. Survey of Alabama Information Series 51. Univ. of Alabama. 135 p.
- Forbes, V.E. and T.L. Forbes. 1994. Ecotoxicology in theory and practice. Chapman and Hall. New York. 247 p.
- May, E.B. 1971. A survey of the oyster shell resources of Alabama. Alabama Marine Resources Bulletin 4:1-53.
- McClintock, J.B., K.R. Marion, J. Dindo, P.W. Hseuh and R.A. Agnus. 1993. Population studies of blue crabs in soft-bottom, unvegetated habitats of a subestuary in the northern Gulf of Mexico. Journal of Crustacean Biology 13: 551-563.
- Neumann, C.C., E.C. Cry and B. Jarvinen. 1981. Tropical cyclones of the North Atlantic Ocean, 1871-1980. National Climate Center, Asheville, NC. 23 p.
- Ritter, A.P. 1896. Report on a reconnaissance of the oyster beds of Mobile Bay and Mississippi Sound, Alabama. Bulletin of the United States Fishery Commission for 1895: 325-352.
- Schroeder, W.W., W.J. Wiseman, Jr., A. Williams, Jr., D.C. Raney and G.C. April. 1990. Climate and Oceanography. Mobile Bay: Issues, Resources, Status and Management. p. 27-51. In NOAA Estuary-of-the-Month Seminar Series No. 15. U.S. Department of Commerce, Washington, D.C.

Schroeder, W.W. 1996. Environmental Setting. *in* Weeks Bay Estuarine Research Reserve: An Estuarine Profile and Bibliography, T. Miller-Way, M. Dardeau, G. Crozier, eds. Dauphin Island Sea Lab Technical Report 96-01. 127 p.

Smith, W.E., 1986. Geomorphology of coastal Baldwin County, Alabama. Geological Survey of Alabama Bulletin 124. 186 p.

South Alabama Regional Planning Commission. 1993. Baldwin County Long Range Development and Management Plan Situation Analysis. 259 p.

Stout, J.P. and M.J. Lelong. 1981. Wetland habitats of the Alabama Coastal Area. Part II. An inventory of wetland habitats south of the Battleship Parkway. Alabama Coastal Area Board Technical Publication CAB-81-01.

Trewartha, G.T. and L.H. Horn. 1980. An Introduction to Climate. McGraw-Hill, New York, NY.

Valentine, J. and T. Lynn. 1996. Pollution in Weeks Bay Estuarine Research Reserve: An Estuarine Profile and Bibliography, T. Miller-Way, M. Dardeau, G. Crozier, eds. Dauphin Island Sea Lab Technical Report 96-01. 127 p.

Weber, M., R.T. Townsend, and R. Bierce. 1992. Environmental Quality in the Gulf of Mexico. 2nd, Ed. Center for Marine Conservation. Washington, D.C. 132 p.

Williams, A. Jr. 1973. The use of radar in climatological research. American Association of Geographers Resources Paper No. 23: 19-25.

Appendix I

Project Advisory Committees

I. Citizen Advisory Committee

Gena Todia, Chair, Wetland Resources, Inc.
 Everette Weeks, Vice-Chair, TR Miller Mill Company, Inc.
 Carey Bentley, Citizen, Past Chair
 Bill Penry, Farmer
 Dr. Bob Miller, Citizen
 Jim Berry, Flowerwood Nursery
 Leslie Weeks, Attorney
 Commissioner Joe Faust, BBC
 Cliff Pitman, Baldwin County Homebuilders
 Ken Stuart, Flowerwood Nursery
 Mary Ann Underwood, Educator
 Everett Smith, Geologist
 Tom Walthousen, International Paper
 Frank Leatherbury, Realtor
 Craig Dyas, Developer

II. Technical Advisory Committee

Randy Roach, Chair, U.S. Fish and Wildlife Service
 Larry Morris, NRCS
 Gary Jones, NRCS
 Patti Hurley, ADEM
 Randy Shaneyfelt, ADEM
 Mike Dardeau, Dauphin Island Sea Lab
 Dr. Kevin White, Univ. of South Alabama
 Will Brantley, Baldwin County Planning and Zoning
 Jim Hairston, Alabama Cooperative Extension System
 Pres Allinder, Alabama Department of Public Health
 Gena Todia, Citizen Advisory Committee
 Sonya Wood-Mahler, Alabama Cooperative Extension System
 John Paul O'Driscoll, Alabama Department of Public Health
 Roland Perry, Gulf Coast RC & D
 Bob Chandler, Geological Survey of Alabama
 Teddy King, Baldwin County Dept. of Public Health
 Eve Brantley, Auburn Marine Extension
 Carey Bentley, Citizen Advisory Committee
 Bob McCormack, WBNERR
 Scott Phipps, WBNERR
 LG Adams, WBNERR

III. Education Committee

Margaret Holcombe, WBNERR

LG Adams, WBNERR
Mary Ann Underwood, Educator
Patti Hurley, ADEM
Eve Brantley, Auburn Marine Extension
Bob McCormack, WBNERR
Randy Shaneyfelt, ADEM

Appendix II

Week Bay Watershed Restoration Action Strategies for 303(d) Listed Streams

Note for review of Fecal coliform:

Fish and Wildlife Classification:

Fecal Coliform Bacteria Criteria:

June through September

Geometric Mean of 5 samples collected during a 30-day period at intervals not less than 24 hours → 100 colonies / 100 ml in Coastal waters and 200 colonies / 100 ml in all other waters

October through May

Geometric Mean of 5 samples collected during a 30-day period at intervals not less than 24 hours → 1000 colonies / 100 ml, single sample maximum of 2000 colonies / 100 ml

Swimming Classification:

Fecal Coliform Bacteria Criteria:

Geometric Mean of 5 samples collected during a 30-day period at intervals not less than 24 hours → 100 colonies / 100 ml in Coastal waters and 200 colonies / 100 ml in all other waters

For OE/DO Organic Enrichment/Dissolved Oxygen

The concern is usually low dissolved oxygen, not nutrients

1. Caney Branch Strategy

Water body & Use	Pollutant Cause	Reported Sources	Downstream/upstream	Draft TMDL
Caney Branch F&W	Pathogens	Pasture Grazing – riparian	Fish River to its source	01- June, 04

Sampling site 8-A for GSA January 1994-December 1998

58 samples Violations: 9 Fecal coliform (were extremely high)
3 Turbidity

4 samplings Biological condition – good Habitat - good

Comments from sampler: Animals in the stream at the above stream area

2. Fish River Strategy

Water body & Use	Pollutant Cause	Reported Sources	Downstream/upstream	Draft TMDL
Fish River F&W/Swim	Mercury, Pathogens	Unknown Source	Weeks Bay to its source	01- June, 05

Sampling site 9 for GSA January 1994-December 1998

59 samples Violations: 5 Fecal coliform (were extremely high)
2 Turbidity

7 samplings Biological condition – poor Habitat - good

Comments from sampler:

Sampling site 2for GSA January 1994-December 1998

58samples Violations: 5 Fecal coliform (were extremely high)
3 turbidity

7 samplings Biological condition –fair Habitat - good

Comments from sampler:

Sampling site 1 for GSA January 1994-December 1998

59 samples Violations: 3 Fecal coliform (were extremely high)
5 DO 1 Turbidity

No Biological condition

Comments from sampler:

Fish tissue study of two sites in two years found high levels of mercury

Investigate the relative impact of mercury in fish tissue in Baldwin and Mobile Counties in comparison to the ponds and other water bodies in the area.

3. Magnolia River Strategy

Water body & Use	Pollutant Cause	Reported Sources	Downstream/upstream	Draft TMDL
Magnolia River F&W/Swim	Organic Enrichment & Dissolved Oxygen	Land Development & Onsite Wastewater Systems	Baldwin County Rd. 49 to Baldwin County Rd. 24	01- June, 04

Sample site 12 for GSA January 1994-December 1998

48 samples Violations: 9 DO

5 biological samples were fairly poor but habitat good.

Sample site16 for GSA January 1994 – December 1998

48 samples Violations: 5 DO

5 biological samples were fair and habitat fairly good

4. UT to Magnolia River Strategy (Brantley Branch)

Water body & Use	Pollutant Cause	Reported Sources	Downstream/upstream	Draft TMDL
UT to Magnolia River FW	Pathogens	Agriculture	Baldwin Co. Rd. 65 to its Source	01- June, 04

Sample site 15 for GSA January 1994-December 1998

48 Samples Violations: 4 fecal coliform 19 DO

Biological samples were poor and habitat good

All stream segments need land use maps and pictures of the sites. A better source identification needs to be made. All of this information will expand as we study the segments one by one. Refer to Alabama's Draft 2000 Section 303*(d) List: "Fact Sheet". A "Comprehensive Assessment and Listing Methodology" will be required by EPA with the 2002 List. When it is written, the study of impacts will most likely be addressed differently.

Appendix III

Alabama's Draft 2000 Section 303(d) List Fact Sheet

Background

Section 303(d) of the Clean Water Act requires that each state identify those waters that do not currently support designated uses, and establish a priority ranking of the waters taking into account the severity of the pollution and the uses to be made of the waters. For each water on the list, the state is required to establish the total maximum daily load (TMDL) for the pollutant or pollutants of concern at a level necessary to implement the applicable water quality standards. Guidance issued in August 1997 by the Environmental Protection Agency (EPA) suggests that states also include a schedule for TMDL development. The schedule is included as part of Alabama's draft 2000 list and provides expected completion dates for waterbodies on the list. Expected completion dates range from one to ten years following EPA approval of the 2000 list and were established to be consistent with the TMDL completion schedule outlined in EPA's settlement agreement with plaintiffs in the 1998 TMDL lawsuit. As a result, TMDL completion dates for many of the segments shown on the draft 2000 Section 303(d) list may be different than those shown on the 1998 list.

2000 Section 303(d) List

Alabama's draft 2000 Section 303(d) list includes segments of rivers, streams, lakes, reservoirs, and estuaries that either do not support or partially support their currently designated use or uses. Most of the waterbodies on the 2000 Section 303(d) list also appeared on Alabama's 1998 Section 303(d) list, which was developed using the 1996 Water Quality Report to Congress (305(b) Report). The Department has attempted to obtain and evaluate all existing and readily available water quality related data and information. The draft 2000 §303(d) list was developed using the 1998 §303(d) list as the starting point. Data in EPA's STorage and RETrieval (STORET) database, information from §319 nonpoint assessments, other Federal and State agencies, industries, and watershed initiatives were evaluated as the draft 2000 §303(d) list was compiled. Any individual or organization could submit additional data or information during the advertised comment period relative to water quality impairment in stream segments not included on the draft list. Chemical, physical, and biological data collected primarily during the previous five years were considered in compiling the draft 2000 Section 303(d) list. Data older than five years was generally not considered. Data sources include the Alabama Department of Environmental Management, the Alabama Department of Public Health, the Geological Survey of Alabama, the United States Geological Survey, the Tennessee Valley Authority, other public agencies, universities, and industries.

The list contains information such as the waterbody name, county(s) in which the listed segment is located, dates when the data on which the listing is based were collected, cause(s) for the use impairment, the source(s) of the pollutant(s) causing the impairment, the size of the impaired segment, and the location of the listed waterbody. Also included on the list is the segment's priority ranking (high, low, medium), which was developed using the attached prioritization strategy.

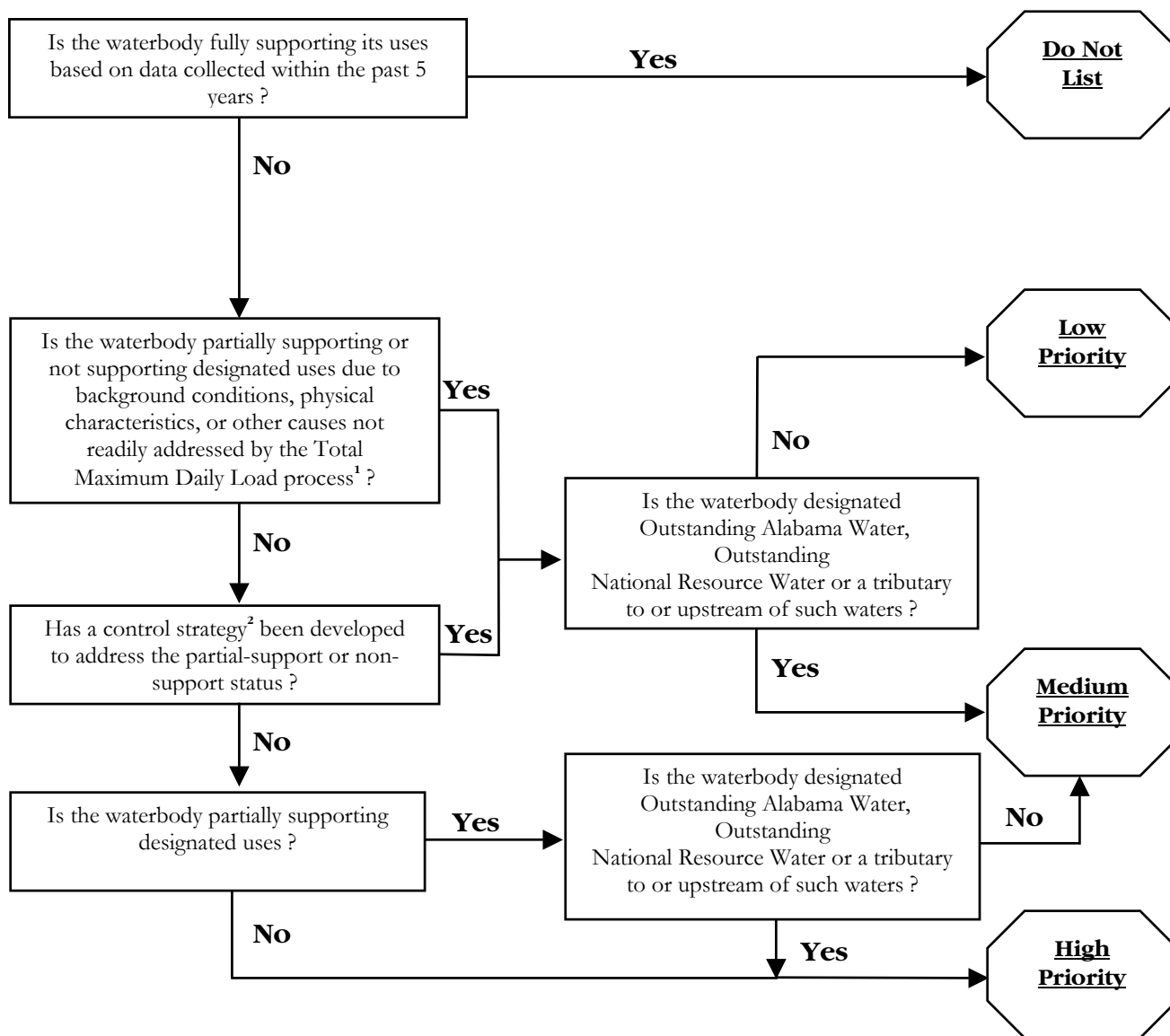
Use-support status for waterbodies was determined in several ways. In cases where the monitored data was primarily chemical data from the water column, use-support status was based on the percentage of measurements not meeting the applicable water quality standard. When 10 percent or fewer measurements exceeded a water quality standard, the waterbody was considered to be fully supporting its designated use. When less than 25 percent but more than 10 percent of the measurements exceeded a water quality standard, the waterbody was considered to be partially supporting its designated use. When more than 25 percent of the measurements exceeded a water quality standard, the waterbody was considered to be not supporting its designated use. In other waterbodies, use-support status was assigned based on fish consumption or shellfish harvesting advisories issued by the Alabama Department of Public Health. Best professional judgment was used in assigning use-support status in cases where monitored data was limited in areal extent or temporal coverage and where numeric water quality criteria were not available. Where available, biological assessment data were used in combination with other surface water quality data or information to arrive at an overall use support determination.

Changes Since the 1998 Section 303(d) List

A number of differences exist between the draft 2000 Section 303(d) List and the 1998 list. Many of the changes were to correct errors in the 1998 list and to provide additional or updated information about waterbodies on the list. Other significant changes since 1998 include the addition and deletion of waterbodies

Changes have also been made to the TMDL completion schedule included on the draft 2000 Section 303(d) list. The changes reflect the pace of TMDL development that can reasonably be expected given ADEM's current funding and staffing levels and the need to meet court-ordered TMDL completion dates. The dates shown are for completion of all TMDLs required for the listed segment. Where more than one TMDL is required for a segment, TMDLs for specific pollutants may be developed well in advance of the expected completion date given on the list.

2000 §303(d) List Prioritization Strategy



1 Examples of other causes not readily addressed by the TMDL process include in place contaminants, flow regulation/modification, unknown sources, and atmospheric deposition.

2 Examples of control strategies include wastewater treatment upgrades or removal, best management practice implementation, and permit modifications.